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EDITORIAL NOTES—GAS, &c.

Midland Association Meeting—Secondary Sources of Revenue.

GAS undertakings, as money-making enterprises, have been very successful in the past; but that is no reason why new sources of profit should not be developed if this can be done without injury to existing ones. The members of the Midland Association of Gas Managers, under the presidency of Mr. Fletcher W. Stevenson, were engaged last Thursday in exploring the by-ways and hedges of gas manufacture to see whether they could not find means of turning to more profitable account certain of the materials they possess as the result of the conversion of coal into gas and residual solids and liquids, as well as the operative power arising from the distribution of the gas. In this congenial task, they were led by Mr. Samuel Glover and Mr. Thomas Berridge—by the former in one of the most comprehensive and practical papers we have ever heard read on the subject of "Gas-Works Residual Products;" and by the latter in a paper opening up visions of revenue for almost nothing, by carrying on a kind of side-business in the synchronizing of clocks by gas pressure.

The paper by Mr. Glover covered a large area in the secondary work of a gas undertaking; and no one better than he could run over, in a compressed yet clear style, the plant for working up the crude residual products of gas manufacture, interspersing description of advance and present state by counsel—the essence of wide experience. Mr. Glover lives in an atmosphere of chemical activity; and it appears to have become part of his nature. But he comes of that long-headed stock that does not allow personal fancy to carry him off into impracticability and unprofitableness. "Because I do a certain thing," says Mr. Glover in effect, "is no reason why another gas engineer should go and do "likewise; nor because another gas engineer finds one way "of doing a particular thing correct in his circumstances, is "no reason that it should be correct for me." Local surroundings and conditions must in every case decide whether certain residuals should be worked up or sold direct, or what treatment other residuals should be subjected to in order to open up the most productive markets. A gas-works administration's whole policy in regard to the treatment of residuals must, in other words, have its seat on financial superiority in each and every direction. Therefore it is for every man to examine well his environment in respect of his residuals, and determine for himself the course to pursue. But before determining, the advice should be remembered, "Know your residuals, if you would get the best possible "out of them." If a gas manager determines that a change in his methods of dealing with or handling his residuals would be beneficial, then he will find, through the paper under notice, that in the author he has, in this particular matter, a safe guide, philosopher, and friend.

There can be no doubt about the length and breadth of Mr. Glover's experience with sulphate of ammonia processes; and, therefore, no small amount of value attaches to the model plan that he presents for a sulphate plant, which appears to lend itself well to adaptation in meeting the requirements of any gas-works in a position to produce sulphate of ammonia on an economical scale. By the plant, it is claimed that a perfectly white sulphate can be obtained, using ordinary commercial sulphuric acid. This will be recognized as an extremely useful part of the paper; and it will certainly be assiduously studied by those many gas managers who have hitherto refrained from adopting sulphate plant owing to the difficulty they foresaw of disposing of their effluent liquor. But with the perfected process of spent liquor purification (the reliability of which has been largely attested) of Mr. John Radcliffe, as fully described in the "JOURNAL" for the 2nd inst., that difficulty has now been overcome. Sutton and Waltham Abbey have testified to its efficiency; and Coventry will, it is hoped, before long be supplementing the experience. There was some question at the meeting as to whether the effluent after this purification was as innocuous on admission to streams as it was found to be, up to a certain percentage, in connection with the bacterial treatment of sewage. There appears to be testimony on this head in a paragraph in the "JOURNAL" for Oct. 9, from which it is gathered that the effluent liquor of a chemical works that had been, before treatment, destructive of fish in a canal belonging to the Midland Railway Company, was, after purification by this process, pronounced harmless by experts consulted by the Railway Company. The importance of such a system, in widening the possibilities of sulphate of ammonia manufacture among undertakings that have been debarred by the trouble of the spent effluent from engaging in it, cannot be over-rated.

Mr. Glover is one of the few gas engineers of the country who can also boast of a tar-distilling plant as an adjunct to his gas-manufacturing operations; and here again it is all a question of environment. In his case, he is able to get double the value from his tar, through this plant, that he was able to get without its aid; but there are not many Midland gas engineers who would, with tar-distilling works almost at their own doors, find it would pay to lay out capital and enter into the treatment of their tar produce in the manner that Mr. Glover does. In conjunction with this branch of the subject, the author had some remarks to make on the question of the use of tar in road making and improvement. There are repeated signs of this particular utilization of tar being a rapidly growing business for gas undertakings—and the more rapid and greater, the better. The author's remarks in the paper and in the discussion, with those of other members, when read and considered in conjunction with the recent statement of Mr. H. P. Maybury, involve one in a matter of much interest. Mr. Glover's observations as a tar distiller of large experience must be treated with respect; and they certainly open up a new view as to the relative suitability of the tar of different gas-works for this purpose of road making and coating. There are tars and tars—tars suitable, and tars unsuitable. It seems a long stretch between carbonization and the use of tar for road purposes; but Mr. Glover establishes, to his own and many other engineers' satisfaction, though not to all, a connection that brings them close together. A tar that is unsuitable for road purposes, without further treatment, Mr. Glover asserts in effect, is so because the gas maker has not taken out of it all that is valuable to him; and these valuable constituents, while lost to the gas maker, are of no use to the purchaser of tar for road utilization—he merely boiling or heating the raw tar before employing it. In other words, as we understand Mr. Glover, it is those tars that contain the largest percentage of constituents valuable to the gas maker, that are least suitable for use on roads while in the raw state, through their tendency to produce the oily emulsion which is very disagreeable to have on roads. There may be in this an explanation of the contradictory reports we have received from time to time as to the suitability and otherwise of gas-works tar. It is evident that, accepting Mr. Glover's dictum in this matter, those gas engineers who have tar that is directly applicable to road purposes may congratulate themselves on carrying on their carbonization in a manner that simultaneously conserves the valuable constituents referred to, and produces a tar that can be successfully employed without trouble by the road authorities. There is, therefore, no impropriety in enjoining the necessity of a greater knowledge by gas producers of their residuals through analysis; for without the intimacy that comes from a deeper investigation than superficial inspection, coal tar will always be to the producer nothing more than—well, coal tar. The paper and discussion were illuminating on this point.

These and many other matters affecting the residuals of

gas manufacture were duly handled in the paper. By the application, within the limits of profitable opportunity, of these various means of treatment and utilization, Mr. Glover's net manufacturing cost, for a gas of a high degree of illuminating power and purity, has been—taking the average of recent years—5d. per 1000 cubic feet in the holder. One other point. Richly-deserved recognition was made by Mr. Glover—and his remarks were endorsed by the members generally—of the great assistance rendered by the Chief Inspector of Alkali Works (Mr. Forbes Carpenter) and his assistants by the advice they give and the suggestions they offer from the experience amassed by them in the execution of their duties. While not violating those duties in any way, they make them more effective by kindly interest and acts.

As to the second paper. On several occasions attention has, at the Midland meetings, been directed to the system of synchronizing clocks at Leamington, by a temporary increase of the pressure in the distribution mains; and the contribution of Mr. Berridge fills many blanks in the information. The Syndicate who have the matter in hand there have proved the practicability of the system, which does great credit to the ingenuity of the inventors. The successful demonstration of practicability is a big step in advance for any new application; and therefore the clock-synchronizing system has now reached a stage at Leamington at which it will attract to itself interest and inquiry from beyond the town. If there is revenue to be had from it, gas undertakings may as well participate, so long as the system does not come into conflict with those street-lamp igniting and extinguishing devices that are also actuated by increases of pressure —increases that come well within the 12-10ths mentioned by Mr. Berridge. It may be possible to alter pressures with impunity without affecting the synchronizing arrangements except at the time fixed—say, at 3 o'clock in the morning; but it would not always do to have street-lamps that are automatically operated by pressure to be again lighted up or extinguished at that particular hour. Perhaps Mr. Berridge will explain how he would meet such a case as that of Tottenham, where there are now several hundred street lamps fitted on Dr. Rostin's system, and where there will shortly be some 1200. However, the paper will awaken interest among gas engineers looking out for fresh sources of revenue.

Outside the papers, the proceedings at the meeting embraced the election of office-bearers for the ensuing year. If Nottingham requires further testimony as to the estimation in which Mr. J. H. Brown is held by his professional colleagues, it is furnished by his unanimous election for 1907 to the presidential chair of the Association. It is a further recognition of Mr. Brown's ability and industry in the higher branches of the technical affairs of the industry, and in its practical and commercial work. Hearty welcome was also given to the announcement of the election of Mr. Hubert Pooley, of Stafford, to the Vice-Presidency.

Local Authorities in Parliament.

A FORTNIGHT ago, criticism was made, in connection with the first batch of Acts under notice investing existing statutory Gas Companies with additional powers, of the exactions of Local Authorities as the price of the withdrawal of their opposition. This week the Acts of the past session of Local Authorities are under review; and, in several ways, they portray a great want of precision between the dealings of Parliament with, respectively, Companies and Local Authorities owning gas undertakings. There is a proviso of the discounts clause applied to gas undertakings which says that the measure of rebate to consumers shall be the same under like circumstances; but this is not one of the golden rules that the Legislature apply to the enactments affecting Gas Companies on the one hand and Local Authorities on the other. Local Authorities may squeeze Gas Companies to an ultra degree; but there is no one in similar position to squeeze advantage for the gas consumers from the supplying authority safely ensconced in a local supremacy. And Parliament does not take upon itself to the extent that it might do the regulative functions of an umpire, in order that consumers, whether they purchase from the Local Authority or the Gas Company, may be equally protected. Controlling laws, though not so comprehensive as in the case of Gas Companies, are made for Local Authorities; but a Local Authority, being their own lords and masters, discriminate favourably on their own side as to compliance, excepting just at those financial points where they come into touch with the Local Government Board. The consumer under the Local Authority has not the incomparable advantage of the sliding-scale; and on looking at the (taken as a whole) miscellaneous character and indifferent rank of gas measures presented by Local Authorities as a result of last session's work, there are several other ways in which it is observed that consumers are undefended, and difference is made between the two forms of gas administration.

In the first place, it is an old plea of a hostile Local Authority, when Gas Companies are asking for a goodly sum of capital, that, if granted, it will exempt the Company's proceedings and affairs from the review of Parliament for an unthinkable number of years; and that such abstention is neither good for the community the Company serve nor for their own vitality. This is a matter on which points of view and opinion are sometimes diametrically opposed. And, forsooth, at the present time, there is little encouragement to private enterprise to appear before Parliament, with embarrassment, not aid, the policy of misguided and narrow-minded local governors. However, the Acts noticed in other columns this week do not suggest that Local Authorities are particularly anxious for their own proceedings to come at frequent intervals under the review of Parliament. The amount of parliamentary work the Gas Departments of Urban Councils produce is insignificant in comparison with that of Gas Companies. Why is it? If the periodical review of the proceedings of Gas Companies is desirable, surely it is equally so in the case of Local Authorities. It is not because Local Authority gas undertakings furnish a small proportion of the whole. Speaking generally, and excepting London, the Local Authorities have the fat of the land so far as gas-supply districts are concerned. This is abundantly indicated by the fact that, although the amount of capital borrowed by Urban Councils for gas supply is not quite half the amount paid up in the case of Gas Companies, and the length of gas-mains two-thirds that of Gas Companies, the Local Authorities, in the aggregate, are only short by between 400,000 and 500,000 of the number of consumers possessed by the Gas Companies, and they have nearly as many public lamps connected with their distribution systems. Under the circumstances, if the rule of periodical review which, professedly in the interests of the consumers, Local Authorities clamour for session after session in the case of Gas Companies, were applied to Local Authorities, there would be a better representation of Bills from them, and a representation more in proportion with that of the Gas Companies. Looking down the measures emanating from Borough and District Councils, there are only three (apart from Purchase Acts) that are worth reference in respect of additional borrowing powers, or extensions of works; and they cannot claim to be of really first-rate importance. The three Acts alluded to are those of Carlisle, New Mills, and Newtownards. Probably one reason for this avoidance of Parliament by Local Authorities is the facility which they possess for obtaining borrowing powers beyond the amounts specified in their Acts by application to the Local Government Board; and the eight, ten, or a dozen years that Local Authorities consider all too long for Gas Companies to abstain from the scrutiny of Parliament (and, of course incidentally, of the Local Authorities themselves) are periods that have no relation to the periods of municipal reluctance to appear at Westminster—not that much harm or good comes to anyone, under present circumstances, from their appearance, so far as gas supply goes.

Touching the point as to the protection of the consumers, it is of interest to note that of the authorities in Parliament this year, only two—the New Mills and Thornton Councils —have adopted the modern conditions of testing for illuminating power; and the Wolstanton Council have specified the "Wandsworth" burner. The Pontefract Corporation, who have obtained compulsory powers of purchase of the Gas Company's property, are not taking any great thought for the interests of the consumers; and their testing clause is a model of terseness and modesty. Neither ancient nor modern methods of testing disturb them much. All that their testing provision calls upon them to do is to use for testing that is not made compulsory a 24-hole argand burner, or any other burner that may be approved by the Board of Trade. But why does not Parliament insist on applying the modern gas clause to Local Authorities as they have done in the case of Companies? Perhaps Parliament are aware

that the imposition of testing clauses of any kind in the case of Local Authorities is rather an empty proceeding; for, generally speaking, excepting for private information, the testing of gas for quality and impurity is a much neglected practice where Corporations or District Councils are the gas distributors. Among other features of the Acts reviewed this week, are the purchase powers obtained—in addition to Pontefract—by Thornton and Wolstanton, mostly under permissive authorization appearing in older Acts of other Authorities. It is also remarked that the periods of repayment for loans requested by local authorities have been curtailed since the Bills were introduced. But it is the way of Local Authorities to open their mouths as widely as possible when their own undertakings are concerned, but to stiffen their backs when Gas Companies' requisitions to Parliament are under consideration.

Looking forward to the next session of Parliament, and now regarding gas legislation generally, the prospect of a brisk time for the coming year is not good. Few companies and local authorities, so far as gas is concerned, appear to be moving towards parliamentary applications; and professional men are not anticipating that the indications will be falsified by the result. The last session does not offer much inducement to Companies to go to Parliament if they can afford to keep away. One case of compulsory purchase and two cases of the imposition of suspensory clauses in one session are sufficient to give a little shock to private enterprise, and to suggest the advisability of waiting for signs of justice and not political prejudice governing the actions of the Legislature. Of course, the further Joint Bill for the removal of the sulphur restrictions, being a special matter and with a weight of precedent to carry it through, is a promotion that may be engaged in by the Companies concerned without apprehension as to the result.

The Health of Gas-Workers.

NOTWITHSTANDING the arduous nature of the work that falls to the lot of some classes of those occupied in gas manufacture, we are prone to believe that, as a whole, their health and well-being will contrast very favourably with those following other comparable industrial pursuits. This belief is also, we think, truer to-day than it may have been in days gone by—now that machinery of all kinds and apparatus for purification purposes have been introduced and perfected. It is quite true that the exigencies of the carbonization of coal necessitate physical robustness and strong constitutions; but the work, though hard, is by no means unhealthy. It strengthens the strong. So also we think that it might conclusively be shown from statistics relating to sickness, longevity, old-age pensions, and the like, that the general body of gas-workers is characterized by the inestimable boon of good health and strength, and a considerable degree of immunity from the "ills that flesh is heir to."

This view is, to a certain extent, that also which Dr. Piero Torretta, the Medical Officer of Health to the Turin Consumers' Gas Company, expressed in a paper, of which we give an abstract in another column, which he read to an International Congress at Milan, held to consider industrial diseases. We qualify somewhat his agreement with our own opinion because—as is often the case when the medical faculty consider industrial questions and environment from their abstract and hygienic point of view—they are apt to colour their expressions in a rather alarmist and pessimistic way. Thus, at periods, the medical journals have alarmed us at the dangers to the common weal lurking in unsuspected places—in copper coins and bank-notes passing from hand to hand, dust and motor cars, railway carriages, and so forth. So too, Dr. Torretta is perhaps too fearful of the danger of poisoning by carbonic oxide that he thinks exists in gas-works and in gas-main trenches. To do him justice, however, his conclusions give no real countenance to such apprehensions. He finds that, in the work of carbonization, there is no fear of either acute or chronic gas poisoning; and it is only in such work as cleaning out gasholders and mains that risks of contracting either or both of these forms of gaseous poisoning occur. "The danger of asphyxiation "from coal-gas," he sums up, "is found only among a small "number of gas workmen." That danger, such as it is, may certainly be said to be very remote, considering the large number of workmen engaged, and the extremely small number of cases—in just the same way that the risks of accident from railway travelling are so slight as to be altogether negligible. The most simple and safe things devised for the use and benefit of mankind, may easily become perverted into dangerous and harmful objects by their abuse by mankind. If gas be breathed instead of being properly burnt, the fault lies not with the gas but with the man.

The paper makes mention of the use of masks and other means of enabling men to work in foul atmospheres, by isolating them from surrounding noxious fumes. It is certainly noticeable that in gas-works on the Continent—especially in France, Germany, and Italy—such devices are more frequently met with and used than they are with us. Among the papers presented every year to the meetings of the Société Technique du Gaz en France, it is quite usual to find one describing some such appliance. Why there should be this contrast is perhaps not quite evident, unless it be that the English gas man prefers to avoid altogether, or does not recognize the necessity of, working in a gas-laden atmosphere. There would certainly seem to be reason in this; for the mask or isolating dress can be no protection against explosion, which one might think would be liable to occur from work carried on under such adverse conditions as the use of the mask implies. Or is it that the English workman's character leads him to disdain any such disguise as makes him appear something between a motorist and a diver? However this may be, we quite agree with the primary means suggested by Dr. Torretta for the prevention of gas poisoning, or, indeed, against any gas accident—that is, education of the workman; education, so that he may know and understand the formation, possibilities, uses, and dangers of the gas that he is daily making and daily distributing. Such education would go far to check that spirit of bravado and recklessness, the outcome of ignorance, which is sometimes met with in gas-workers. Instances will be called to mind where, had the workman had this intimate knowledge that is advocated, accidents might have been avoided and lives saved. While, therefore, we do not recognize any unusual dangers for, or abnormal tendencies to disease in, gas-workers, we entirely agree with the old maxim that "prevention is better than cure," and so strongly support all means for rendering industrial pursuits as hygienic and as harmless as possible. Further, we believe in having in readiness all medical requirements and conveniences for the immediate alleviation, where possible, of suffering from accidents, which are always liable to occur even in the best-ordered gas-works, as elsewhere.

The Special Purposes Fund of the Institution.

The miserable result, so far, of the special appeal that has been made by the Institution to gas undertakings for subscriptions to the special purposes fund is most disappointing; and it shows the difficulty, as did the appeal of the Southern Association for their naphthalene research, of engaging the interests of the administrators of gas undertakings in plans for thorough investigation into problems the solution of, and expansion of information on, which would be of advantage to the gas industry as a whole. The Council of the Institution have desired us to announce that the amount of the subscriptions received to date is £581 13s., from 145 undertakings; the majority of the subscriptions being based on the scale suggested in the circular inviting subscriptions—viz., 6d. per million cubic feet of gas made annually. The receipts so far only give an average of about £4 per undertaking; and they also represent an average production per undertaking, at 6d. per million, of 160 millions of gas per annum, or a total production of 23,266 million cubic feet. The 145 undertakings and this 23,266 millions of production look pitifully small when placed in comparison with the 734 undertakings included in the last-issued Board of Trade returns, and their total of 168,647 million cubic feet production. If all of these authorized undertakings contributed 6d. per million, the income for the special purposes fund would amount to about £4216, which would enable the Institution to do handsome work; but the £581 will not carry them far, as witness the Southern naphthalene investigation. The unrepresented production divided by the undertakings that have not yet subscribed shows that their average make is 247 millions, so there must be a considerable number of prominent undertakings that are among the non-subscribers. What is there amiss with the Institution that its work is not better supported by the administrators of gas undertakings. We are

inclined to think that there is only one way to interest them, and that is to extend the classes of membership of the Institution so as to include Chairmen of Boards and Committees; and thus bring administration into closer touch with the technical work of the organization. There may be one other means—the efficacy of which, however, may be only temporary—of supplementing the present slender contribution to the fund, and that is by publishing the names of the subscribers. They deserve the honour of publicity; and it is difficult to understand why the Council have not already taken this step. We sincerely urge on gas undertakings the importance of subscribing to the fund. It is no idle game that the Institution are proposing; but something to benefit not one gas undertaking, but all.

Merthyr Town Council and the Gas-Works.

Judging from the speeches made at a special meeting of the Merthyr Tydvil Town Council, a report of which appears in another part of to-day's issue, electricity has firm friends among the members; while at the same time it may be remarked that some rather hazy notions with regard to the position of the gas industry are entertained by the gentlemen who have been deputed to look after the interests of the ratepayers in this particular place. The question before the Council was as to whether or not a Bill should be promoted in the next session of Parliament to empower the Corporation to manufacture and supply gas within the borough and neighbourhood and to acquire the undertakings of the Merthyr Tydvil Gas Company and the Dowlais Gas and Coke Company. The Bill was also to include various other provisions for the improvement of the town; but it was arranged that if the gas-works proposals were defeated, the other matters would not be proceeded with. The members therefore devoted their attention to a consideration of the advisability or otherwise of acquiring the undertakings of the two Gas Companies named; and after a lengthy debate, it was decided, by sixteen votes to twelve, that the purchase scheme should not be proceeded with. Of course, it was perfectly open to the members thus to determine, if they chose; and so far as their own particular case was concerned, it may be supposed they acted in accordance with their best judgment. To some remarks, however, which were made on the general position of the gas industry, we must take exception. For instance, one member argued that the time for purchasing gas-works had long since gone by—the reason he gave being that "they were out of date." It might be supposed that he would find some difficulty in producing facts to bear out this astonishing proposition; but he endeavoured to do so—with results most unfortunate for his own argument, for he said that "such enterprising places as Cardiff, Newport, and Swansea had persistently left them alone." Now, whatever may be the reason for the Municipalities of these towns not having acquired the undertakings, it certainly is not because the gas-works are out of date, for more prosperous private enterprises it would be difficult to find than the Companies who supply these three places with gas. With all due deference to the opinions of this gentleman, we are unable to find anywhere even the slightest suspicion of justification for his assertion that "gas is a declining industry, and electricity is likely to monopolize the whole field." On the contrary, everything goes to prove that the gas industry in the future will enjoy a prosperity at least equal to that which it has experienced in the past. With the particular circumstances affecting Merthyr, we are not now concerning ourselves; but if the majority of the Town Councillors have decided against purchase on such general grounds as those advanced by the member referred to, it may be said that—well, it is, at any rate, not the gas-works which are "out of date."

The Death of One Suspensory Clause.

But there is another effect of great importance in connection with this decision of the Merthyr Council. The vote restores to the local Gas Company their full powers under the Act they obtained this year. It will be remembered that the Company's Act laid the foundation for the precedent of the now famous suspensory clause, which clause has come, in this case, to a timely end through the vote in the Council. It is pretty certain that last year the Council, or those of their body who were representing them in their opposition to the Gas Company's Bill, did not know their own minds, or there would not thus early have been what is practically a reversal of what looked like a certainty in the Committee Rooms a few months ago. There are a lot of little straws blown about by the wind of the moment among town councillors; and one never knows until the end the direction in which the wind will finally blow over any particular matter in which they are concerned. But this shiftiness puts a lot of people to trouble and expense, and places an enervating burden of suspense upon them. We hope that Merthyr has done something to put an end to the imposition of the suspensory clauses.

Opening Meeting of the Yorkshire Junior Association.

Few meetings of this Association, even the annual ones, had been anticipated with greater interest than that held last Saturday, a report which appears in another part of the "JOURNAL," as soon as it was announced that Mr. Thomas Newbigging was going to be the lecturer. To the younger men, especially those who had never seen Mr. Newbigging, the name seemed to have a kind of halo round it; and respect for its bearer had taken on something of awe and veneration. The result was an exceptionally large attendance on Saturday, despite the many powerful local counter-attractions. Moreover, every person present was an actual member of the Yorkshire Association except two or three cordially welcomed members of the Manchester Association. It was a touching and gratifying tribute to Mr. Newbigging to witness the fixed attention of the audience, who not only followed him closely but delightedly, punctuating his points with cheers, smiling as some of his shrewd thrusts got home, and finally giving itself up to peals of spontaneous laughter over his frank admission that, after all, the stern censor who had not spared the follies of football-match devotees and other "simpletons," had himself so far "fallen from grace" as once to have attended a match, though they quite realized that, of course, he had only gone for the good of the profession, to investigate the possibilities of electric lighting. As Professor Smithells happily expressed it, they felt they had before them "a sage and a prophet." A name that had meant so much for them had cystallized itself, as it were, into a living form; and they realized that in the long after-years they would prize the memory of that afternoon's acquaintance with one of the men who have made gas history. Another pleasant feature of the gathering, as well as a good augury for a fruitful session, was the induction of the new President—Mr. G. W. Fligg, of Dewsbury. His attractive personality, his unfailing readiness for work, his shrewd advice, and his confidence in the usefulness and high success of the Association, make him not only a general favourite, but a real tower of strength. Many present remembered how, more than three-and-a-half years ago, over the tea-tables subsequent to a joint visit of Mr. Cranfield's "Gas Manufacture" classes to the Dewsbury Gas-Works, Mr. Fligg had broached the question of the possibility of forming a Yorkshire Junior Association, had gained the enthusiastic support of those present, and had set in motion proceedings which resulted in the formation of the Association in April, 1903. Under his guiding hand, the best results may be confidently looked for. As the members streamed out at the close of the meeting, and gathered at the tea-tables, unanimous and emphatic delight was expressed at the lecture; while it was not overlooked that, with kindly tact, its author had not only joined them at tea, but had been present through the dulness of a mere business meeting, in order to show how completely he wished to identify himself with their interests and well-being.

A Proposed Employers' Strike Fund.

The strikes on the Clyde and in various other parts of the country which are at present, or have lately been, in progress, together with the distinct signs of labour unrest which are to be noticed in different directions, are naturally viewed with a good deal of apprehension among employers; and in spite of the fact that conciliatory methods of settling disputes are now more frequently witnessed than was formerly the case, there is evidently a feeling in some quarters that steps should be taken to fight the Trade Unions with their own weapons. The "Standard," in their Engineering Section, have been devoting some attention to the increasing state of unrest in the labour ranks throughout the country; and in response to their suggestion that the time is now ripe for combined action to be taken, they have received a

number of letters from employers. One of these is from Sir John Bingham, Bart., the head of the firm of Messrs. Walker and Hall, of Sheffield, who suggests the formation of a huge strike insurance fund, towards which he expresses his willingness to guarantee £10,000, provided a large enough fund is established. Some such course as this he thinks will be necessary in order to meet trade disputes (which must eventually be against combined Trade Unions), if the masters intend to obtain or compel fair treatment from the Trade Union leaders as well as the men. The idea is that the guarantees should be collected by someone empowered by the Central Masters' Association or Manufacturers' Association; and Sir John thinks that this plan, if properly commenced and understood, would cause so many millions of pounds to be guaranteed that, in the event of a fight, only an inconsiderable percentage of the money would be required. In order that the Masters' Association should take no advantage, a Committee from their body could be appointed to determine when, and what, proper action should be taken. No member of the trade a dispute in connection with which was at the time under consideration would sit on the Committee; but such persons would be brought before the Committee to give evidence. Though advocating the institution of such a fighting machine as this would create, Sir John is careful to point out that with his many workpeople he has always had the friendliest relations, and his great desire is that master and man should fraternize more than they do in their mutual interests and confidence in one another—especially to combat foreign invasion and foreign protection.

The Organization of Free Labour.

This threatened combination of employers to combat demands which they consider unreasonable and injurious to the trades which it is necessary for the welfare of the country should be fostered, is not the only factor with which the Trade Unionists have to reckon; for there is also the element which is represented by the National Free Labour Association. This is an organization which, in the fourteen years of its existence, claims to have enrolled upwards of 600,000 workers, and to have defeated 546 "senseless strikes," and whose policy is stated to be "one of industrial peace." The Association are now holding their annual congress in London; and, as recorded in last week's "JOURNAL," one of the matters they are considering is a proposal to form a Citizens' Alliance, to oppose "Trade Unionism in its collusion with Socialism." In the report of the Executive Council, the obvious fact is pointed out that people will hesitate to invest their capital in productive enterprises if it means constant struggle and strife with Trade Unions, and if frequent strikes tend to destroy trade by making it difficult to carry out contracts. A good deal of attention is bestowed on the Trades Disputes Bill; and a list is given of the most important disputes during the past year in which the assistance of the Association has been successfully sought. One of the concluding sentences of the report sums up clearly the chief aim of the Association; and it is one to which nobody but Trade Unionists is likely to object: "Employers must be free to employ, and workmen be equally free to be employed, without that dictatorial and coercive interference from individual or organized bodies which characterizes Trade Union treatment of industrial disputes, and irrespective of threatened injury by strike reprisals—a weapon of industrial warfare unscrupulously used by Trade Unionists as if employers had no rights to maintain and no claim to possess them."

The Midland Junior Gas Engineering Association will, by permission of Mr. Fletcher W. Stevenson, the Engineer, pay a visit next Saturday to the new gas-works of the Coventry Corporation at Foleshill. At the conclusion of the inspection, the members will take tea with Mr. Stevenson. A big muster may be anticipated for so interesting and instructive a visit.

Classes in "Gas Manufacture" at Salford.—We learn that arrangements have been made for the delivery, at the Royal Technical Institute, Salford, of courses of lectures on the manufacture and distribution of coal gas, to prepare students for the examinations held by the City and Guilds of London Institute. The lecturer is Mr. D. V. Hollingworth, F.C.S., and he will give about thirty lectures in each branch of the subject. A special feature of his system of instruction is that the students will have an opportunity, at the close of each lecture, of carrying out tests and analyses, as well as of witnessing practical demonstrations. There are already fourteen students in the Ordinary grade.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 344.)

THE week just closed on the Stock Exchange showed a considerable improvement. The tone was good from the first. A cheerful tone characterized the opening; and some buyers of superior stuff for investment came back into the market—Home rails being conspicuous for the support they received. A slight check supervened, but this was soon surmounted; and the brighter view was confirmed when the fortnightly settlement appeared to be going through smoothly. One small failure was reported on Friday; and Americans were flat. But there was no other cloud on the horizon; and so cheerfulness and buoyancy generally prevailed up to the close. In the Money Market, there was a strong demand both for the Stock Exchange and for other purposes, and rates for short loans and for discount were firmly maintained; but before the close, an easier tendency showed itself. Business in the Gas Market was quiet—on some days very much so—and was devoid of remarkable incident. But it certainly seemed to feel more last week the flattening influences which in other markets had made themselves felt earlier. Consequently, there were a good many more changes of quotation in the downward direction than in the upward. But movements were very irregular; and the motive of some of them was not quite obvious. In Gaslight and Coke issues, the ordinary was only moderately dealt in; but the daily figures showed steadiness, and the closing prices were as good as any in the week. On Thursday, the lowest point, 96, was touched once; but the highest, 97½, was marked several times. Dealings in the secured issues were rather more plentiful. The maximum changed hands at from 88 to 88⅞; and the preference at 106¾—the quotation of each being lowered a point. The debenture was done at the wide range of 84½ and 85¾. South Metropolitan opened weak, and fell to 128 on Tuesday and Wednesday; but recovering on Thursday, it marked 130—a fall, however, of 2 in the quotation. The debenture had one transaction at 85. In Commercials, both capital issues were put down a point-and-a-half; but there were only two dealings marked in the 4 per cent. at 112½, so not much harm was done. There were a few dealings in the Suburban and the Provincial group, coupled with some irregular movements. Alliance and Dublin old marked 20⅞ (a fall of ¼), Bournemouth "B" 17 and 17½ (a rise of ½), ditto preference fell 1, British was done at 40½ and 41, Brighton original at 233, Tottenham "B" at 106 (both "A" and "B" advancing a point), and West Ham preference at 120½ and 121¾. In the local Exchanges, Sheffield "C" rose 1; but Newcastle fell ½. Among the Continental Companies, Imperial was moderately dealt in at a fall of a point—prices ranging from 186 to 187¼; and the debenture changed hands once at 96. European fully-paid was active at from 24¼ to 24¾; but Union was a point weaker at from 122 to 123. Among the undertakings of the remoter world, Bombay was done at 7, ditto part-paid at 5⅜ (a rise of ¼), Buenos Ayres at 11⅞ (a fall of ¼), ditto debenture at 97, Primitiva at from 7½ to 7¾, ditto preference at from 5⅛ to 5¼, ditto debenture at 98, River Plate at 12½ and 12¾, San Paulo at 13½, Monte Video at 12 3/16, and Melbourne 5 per cent. at 101½.

The closing prices are shown in our Stock and Share List on page 344.

ELECTRIC LIGHTING MEMORANDA.

Progressive Extravagance—Technical Ability Subservient to Ignorance and Incapacity—Public Lighting Costs per Mile and Otherwise—Easy Consciences and Finance—The Candle-Power Trick—Hiding the Truth.

DURING the past few weeks, literature treating of municipal matters has, with diligent and unsparing hand, been circulated among the luckless ratepayers of the Metropolis, for their edification regarding the ways and doings of our local governors. There have been the leaflet and the pamphlet proclaiming, in forcible and sometimes picturesque language, that the Progressive candidate is the friend of efficiency and of the working man. And there have been the leaflets and pamphlets—largely prepared and issued by that useful organization presided over by the Duke of Norfolk, the London Municipal Society—that have enabled the ratepayers to locate the period of swelling rates to the years in which the Progressive party has been in the ascendant in local control. Over dates and actually paid rates, there can be no dispute; and in the pamphlets in question, the reader is led, by open and intelligible paths, to the scenes of the wastefulness in municipal administration that have produced for the ratepayer an overflowing cup of bitterness. Outside the purely legitimate functions of local administration, municipal trading has been a tax on the ratepayer in the Metropolis as elsewhere. Provision has been made for the few; but the credit of the whole community has been pledged, and the whole community have had to pay. The programme of the London Municipal Society includes the restriction of trading by municipalities to such undertakings as are necessary to the whole community, and which cannot be effectively carried out by private enterprise. That is what should have been, but what is not. But what exists has proved such a disastrous failure, that what the ratepayers must do, if they do not wish to descend from bad to worse, or to a more intolerable condition of things

than at present, is to terminate the reign of misdirection. Wild schemes are being moulded; and these schemes will, if moderation does not get the upper hand—promises to, and blandishments of, the ratepayers notwithstanding—land upon the ratepayers a still greater burden.

The literature of the London Municipal Society is eloquent of the evil influence that municipal management of electricity supply has had upon the local finance of the Metropolis. It is due, however, to the technical officials of the undertakings to say that we cannot believe this condition of things is attributable to them so much as to the system under which they work. The technical officials are made largely ineffective in the discharge of their duties by many masters who have a sublime confidence in the superiority of their own wisdom; and the more democratic the borough, the more does the technical adviser have to play the undignified part of a puppet. It is an inglorious part; and no man can do the best possible for an undertaking, while his actions are restricted, and he is made to work in the irons forged by ignorance and secret motive. The Municipalities of London have got their electricity undertakings into such an overweighted condition through insensate blundering, that, in the vain attempt, by still mistaken expedients, to put a better complexion on affairs, they are making them sink deeper and deeper. The undertakings are classed as "remunerative" in the affected language of officialdom. They were originally launched with the idea that they were going to relieve the rates; it has been the rates and public lighting that have had to relieve them. And Mr. A. Carson Roberts, the Local Government Board Auditor of the accounts of the Metropolitan boroughs, has lately had to make some pretty severe strictures regarding the manner in which the accounts of the trading departments are kept, in respect of hidden faults and meanings.

But it is the public lighting that is a sore matter at the present time, owing to the unfair treatment that the Gas Companies are receiving at the hands of those municipalities who run electric lighting undertakings. From the election literature, some startling figures can be picked as to how the ratepayers are pilfered, through the public lighting, to gain support for the electricity undertakings, and in a fashion that is unknown in those boroughs where there is not municipal possession of the electricity supply. In Camberwell, Lambeth, Lewisham, Wandsworth, Deptford, and Greenwich, the cost of public lighting—incandescent gas lighting being the vogue—ranges from £72 to in no case more than £100 per mile, according to the character of the lighting; while, where there is electric lighting, we get such figures as these: Hammersmith, £152 per mile (lowest cost in London for electric lighted streets); Southwark, £175; Poplar, £192; St. Pancras, £247; Islington, £262; and Shoreditch £335. There is no compensation to the ratepayers for being burdened in this way by the expense of public electric lighting. It is waste, and nothing but waste. Consider the facts that were recently elicited regarding the lighting of Islington streets. The Borough Council own their own electricity supply; and, spite of this, about 100 miles of their thoroughfares are lighted by incandescent gas-lamps for £4077 per annum, while the remaining 20 miles cost £5254, which works out to between six and seven times more per mile than gas-lighting. But what care the Progressives? The Electric Lighting Committee even now have a scheme in hand for erecting an additional 245 arc lamps at a capital cost of £21,011! While, too, the price of electricity has been reduced to private consumers from 5·15d. in 1902-3 to 3·91d. last year, the average price for public lighting has been increased from 2·93d. to 3·47d.! The public street lighting has therefore been a source of large support to the electricity undertaking, at the expense of the ratepayers. At the same time, while the Progressives are vaunting a slender profit on the electrical undertaking, and the "Daily News" is dancing with delight over the remarkable "prosperity," the "Electrical Review" cuts into the boast and joy by proving that the so-called prosperity is all a chimera. Heading the statement with numerous figures, our contemporary declares: "There are no profits yet; and so far as the ratepayers are concerned, they would have been much better off if they had never embarked in a business they did not understand, and upon borrowed capital." We join hands with our contemporary over this line of policy. In Woolwich, again, the contributions from the rates for electric supply deficiencies have been since 1902-3, £2573, £3496, £5528, and £7830, and the estimated deficit for 1906-7 is £8090. And some of these ever-increasing contributions have been insufficient to meet the deficits. Upon this, the charges for street lighting are 3·75d. per unit, against 3·54d. for private consumers—more for public purposes than for private. There can be no defence to such mad incursions into trading as this. The Council's Electric Lighting Department would sink much lower in the public estimation than it has if they had not the street lighting at the stiff price named. That price merely cloaks greater deficiencies; but all the same, the ratepayers have to pay.

There are a few miscellaneous points of which note has been made, and some of which illustrate the cunning of the Borough Councils in nicely adjusting matters between their electricity undertakings and the public lighting. There is Battersea—the Mecca of Municipal Progressives. The electricity undertaking last year showed, or so the spendthrifts of this most democratic of Metropolitan boroughs assert, a small profit; but the charge for the public lamps was put up from £16 to £18! Comment would indeed be superfluous. The St. Pancras Borough Council made a reduction of the charge per lamp for public lighting in 1904-5; but the Council made things right for the Electricity Department by erecting an additional number of electric street lights—thereby securing £1460 more for the Electricity Department than in the previous year, and raising the total costs of public lighting by £1000! This is remarkably clever finance. Last year the cost of street lighting in Fulham was 4d. in the pound; and the electric lighting scheme has been subsidized from the rates to the extent of £21,277. Capital expenditure is still going on. In Southwark, it is alleged that the pale flickering of the electric lights in the streets often affords "food" for laughter; and that in Great Dover Street, Borough, and Newington Causeway, the lamps are sometimes out altogether, and for several minutes at a time. From the ratepayers' point of view, we fail to see the risible side of the matter. If we may add here a fact from the suburbs, it is that at Beckenham the comparative cost per mile is £57 for incandescent gas lighting and £570 for electric arc lighting. In face of these hard facts as to the baneful effect upon local finance and interests of this indulgence in trading, it is marvellous that the *bizarre* notion should have taken root in the minds of the Progressives of Camberwell and Deptford that, when the London County Council electricity scheme has reached embodiment, it will be their duty to leave no stone unturned to get a bulk supply switched on to the districts named, to compete with the 2s. gas and incandescent burners of the South Metropolitan Gas Company. Is it very surprising that some people should hold it true that there is some link between the mental degeneracy of the *personnel* in local government and inflated local debts and rate of expenditure?

There are, however, some wiseacres who, in the discussion of the relative excellencies of gas and electricity in public lighting, think that economy and efficiency can be dealt with in terms of candle power. Mr. Leonard Potts, the Town Clerk of Poplar, is one of these—either by choice or compulsion. Candle power is no criterion of efficient street illumination. As was acknowledged a fortnight ago by the "Electrician," the great majority of streets do not require high-power lamps; but in that great majority of streets it would be easy to put as much "candle power" as the Socialists and Progressives of our local governing bodies choose to prescribe. Worked out to per candle power, the cost would not denote cheapness. A gross of buttons might cost less per button than a dozen; but if only a dozen were required, the difference between that number and the gross would be waste. So in public lighting. In Poplar, the cost of public lighting has increased by £5000 per annum; but Poplar has not morally or industrially improved its position in consequence. Mr. Potts, to justify the enhanced cost, has recently written to the "Daily Telegraph" a letter which, in regard to this particular point, is about as disingenuous as it well could be. He compares the lighting conditions of the year 1897-8 with those of 1905. It would be just about as sensible to compare a star with the sun. In 1897-8, there were 1733 public gas-lamps in the borough, 1700 of which were fitted with single flat-flame gas-burners! Mr. Potts must surely be the tool of others in this matter; for we can hardly think the Town Clerk of a Metropolitan borough would, of his own free will, in 1906, father such absurd lines of comparison. However that may be, we go on to read that in 1905 there were 874 electric lamps in the borough (of which 326 were arcs and 548 incandescent electrics), and 890 gas-lamps. Now comes the humorous part. Says Mr. Potts: "The total candle power of the whole of the lamps in 1898 was 29,670; and in 1905, 657,984. The cost per candle power in 1898 was 55·96d.; and in 1905, it was 4·37d." We cannot imagine anyone trying to prove the righteousness of one of two present systems by placing that one in comparison with a crudeness of the past. Why not compare what is with what might have been if the Council had had the sense to apply incandescent gas-burners to the whole of the street lamps—without wasting several thousands a year extra on electricity, and those thousands of pounds multiplied by the years of their continuance? And who, we should much like to know, has been befooling Mr. Potts over these candle powers? There are now 326 arc lamps to be multiplied by a generous 500 candles = 163,000 candles. There are 548 incandescent electrics to be multiplied, by say (when new) 16 candles = 8768 candles. There are also the 890 gas-lamps. Let us do the Council the credit of supposing they are fitted with (say) 70-candle power gas-burners, at about the same cost as the old flat-flame lamps: 890 × 70 = 62,300 candles. The total of these three quantities would be 234,068 candles, and not 657,984, which makes a difference to the cost per nominal candle power as quoted by Mr. Potts. If all the 1733 gas-lamps had been fitted with incandescent gas-burners giving an average of 70 candles, the total illuminating power would have been 121,310 candles; and this could have been obtained without that additional expense to the ratepayers of £5000 a year, and the lighting would have been quite sufficient. The absurdity of Mr. Potts's cost per nominal candle power of the present must now be apparent to him. It is pitiful when people are misguided into making, or are compelled to make, themselves look foolish. If Mr. Potts will go into the matter more particularly, we shall be happy to discuss it with him.

With all this exposure of the cost of public electric lighting, there is a desire now to keep the truth from the public eye. Just recently at Southwark a member asked for a return as to the comparative cost of electricity and gas for street lighting. The Progressive majority declined to allow the return to be made public. Lately, too, at a Local Government Board inquiry at Bristol, the Borough Electrical Engineer asserted that he was unable to give

the Inspector the comparative figures for gas and electric lighting; and it is hardly credible, but there is the authority of a local newspaper for it, that Alderman Pearson, the Chairman of the Electric Lighting Committee, at a recent meeting of the City Council, "commended the Electrical Engineer for not giving details of the cost of street lighting for the information of all the world, but any member of the Council could have it privately." This is municipal tyranny with a vengeance. Not only waste, but secret waste, is to be the rule. There is only one conclusion to be formed from the action, and it is that those who refuse the information fear the limelight of public criticism. It has been Alderman Pearson's proud boast that everything connected with the Electricity Department at Bristol is above board. He is the first to advocate concealment of the expense of an extravagant system of street lighting.

By a slip of the pen, allusion was made to the Electrical Engineer of the West Ham Corporation in the paragraph of last week's "Memoranda" referring to the Upton Park accident. The allusion was intended to be to the Electrical Engineer of the East Ham Borough Council. With the almost confusing number of East-end Borough Councils supplying electricity, the slip is perhaps pardonable.

GAS ACTS FOR 1906.

FOURTH NOTICE.

IN dealing with Acts relating to gas powers—new or additional—conferred upon Local Authorities, the most important point to be observed is that their number is four less than that of the Bills dealt with on Jan. 23 last; two of the four referring to projects for gas-works purchases which the ratepayers vetoed.

Part 3 of the Bury Corporation Act only consists of seven lines; and it is the only portion of the Act alluding to gas supply. It repeals the provisions of section 7 of the Radcliffe and Pilkington Gas Act of 1854 so far as they relate to the supply of gas by the Radcliffe and Pilkington Gas Company within the present limits of the borough of Bury. The Radcliffe Company have never exercised the powers that they possessed within the limits of the borough; and, therefore, the giving to the Bury Council of exclusive rights of supply within their administrative area does not really affect the Company." [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

In a short Act referring to miscellaneous matters, the Carlisle Corporation have obtained an amendment of section 106 of their Act of 1904. The section alludes to the borrowing powers of the Gas Department; and it will now be read, and have effect, as "if the sum of £30,000 had been inserted, instead of the sum of £15,000." [*Parliamentary Agents: Messrs. Durnford and Co.*]

The Borough Councils of London who have powers to supply electricity are, after much struggling on their behalf by the London County Council, authorized, by the General Powers Bill of the latter, to expend money upon the wiring, fitting, and supplying with electrical apparatus or motors the premises of consumers or prospective consumers. But they are so to adjust the charges to be made by them as to meet the expenditure on this department of their business, including interest upon any money borrowed for the purpose, and all sums to be applied either by way of instalments or contributions to sinking fund for the repayment of the money so borrowed. The sums charged to consumers in respect of wiring and fitting are to be stated on the demand-note distinct from the charge for the electrical energy. This new part of the Borough Councils' electrical business is to have a separate statement in their respective published accounts. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Manchester Corporation Act is but little more than a shadow of its original Bill. Several parts have been cut out bodily; and in this treatment, there has disappeared the clause referring to the transfer to the Corporation of the portion of the Stretford Gas Company's undertaking situated within the township of Chorlton-cum-Hardy. The water clauses of the Bill will be noticed hereafter. [*Parliamentary Agents: Messrs. Parker, Pritchards, Barham, and Lawford.*]

In their Act for powers of great variety, the New Mills District Council obtain authority to utilize certain lands for the erection of gas-works and the manufacture of gas and residual products; and they are also allowed to purchase other lands by agreement up to 5 acres. For heating, cooking, motive power, warming, ventilation, and other purposes, and for the particular requirements of any trade, industry, manufacture, or business, the Council may supply gas "on such terms and conditions in all respects as may be agreed between the Council and the person to whom such supply shall be given." But the discounts clause that appears subsequently in the Act, it would seem, puts a limit to this liberty by specifying a discount of 10 per cent. for prompt payment, and 15 per cent. to large consumers, or for motive power. The price of gas is not to exceed 4s. 6d. per 1000 cubic feet; and the illuminating power of the gas is to be 14 candles, tested by the Metropolitan argand burner No. 2, Harcourt's 10-candle pentane lamp, and a bar photometer. The maximum excess charge for prepayment supply is to be at the rate of 1s. per 1000 cubic feet, to include hire of meter and fittings. The Council proposed an excess charge of 15 per cent. on the cost of a prepayment meter where one is supplied without fittings; but authority has only been given for 10 per cent. The clause has been deleted in which the Council asked to be allowed discretion to demand prepayment for gas, with provision for the adjustment of differences between payment and consumption at specified periods, and the payment of interest at the rate of 4 per cent. per annum on sums so prepaid. The Act of the sixth year of King George IV., entitled "An Act for Lighting with Gas the Towns of New Mills and Hayfield, and the Neighbourhood thereof, in the County of Derby" is repealed. Among the money powers, the Council are authorized to borrow £5000 for the extension and improvement of the gas undertaking; thirty years to be the period of repayment, and not forty as specified in the Bill. Further money may be borrowed with the approval of the Local Government Board; the period of repayment being such as the Board may specify. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The Newtownards District Council are, by their Act, authorized to acquire by agreement certain scheduled lands adjoining the present gas-works on which to extend their gas-manufacturing plant. There is a wonderfully comprehensive set of provisions regarding the displacement of persons of the working class, in connection with the projected scheme. The limits of supply are extended. A number of miscellaneous clauses of now common application to gas undertakers are included in the Act. For the purchase of lands for the gas undertaking, the Council are authorized to borrow £1000, for the construction of additional works £5000, and for the laying of additional mains such sum, not exceeding £2000, as the Local Government Board may sanction. The money borrowed for land purposes is to be repaid within fifty years; the money borrowed for the extension of the works within 35 years, instead of 40 years as suggested in the Bill; and the money borrowed for mains is to be paid off in such period not exceeding 60 years as may be fixed by the Local Government Board. [*Parliamentary Agents: Messrs. Martin and Leslie.*]

The Pontefract Gas Act received the Royal Assent on Aug. 4; and in the "JOURNAL" for Sept. 11, it was announced that the Corporation had decided to give the Gas Company notice of their intention to purchase their undertaking under the powers conferred by the Act—the period within which notice was to be given being three months. The Bill as originally introduced defined the manner in which the arbitration was to be conducted (in the event of the parties failing to agree upon a price), with the view of saving expense. But, for very good reasons, the Company preferred not to have their hands bound, and the Corporation were compelled to give way in this matter. Compensation to officers and servants in the regular employ of the Company who are not retained in the service of the Corporation is provided for. All the necessary and customary powers affecting the winding up and transfer of a Company's business and its future conduct are embraced by the Act. The limits of gas supply are to be the borough and the parish of Carleton. The maximum price of gas was originally proposed at the (for such a borough) extraordinary figure of 5s. 6d.; but it has been reduced to 4s. The illuminating power of the gas is prescribed at 14 candles; but a clause that is unique in the session's legislation in respect of testing crops up here: "The prescribed burner shall be a twenty-four hole argand burner, or such other burner as shall, for the time being, be approved by the Board of Trade on the application of the Corporation." As the Corporation are not likely to be troubled with penalty testing, one burner may be as good as another from their point of view, though not from that of the gas industry as a whole—the general idea trending to uniformity. Protection is given to railway companies in connection with the laying of pipes over or upon property in which they are concerned. The Corporation are empowered to borrow such sums as are necessary for the purchase of the gas-works to be repaid within 40 years; and in relation to gas-works purposes generally, £6000, to be repaid within 25 years. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Thornton District Council Gas Act is the outcome of a section in the Poulton-le-Fylde Gas Act of 1901, which empowered other local authorities within the district of supply of Poulton-le-Fylde to purchase the part of the undertaking within their administrative areas. The transfer of the portion within the Thornton district is now provided for, on agreed terms or as determined by arbitration. All the authority required by the Thornton Council for the carrying on of their business is conferred; and there is also a provision to the effect that agreements may be entered into for the supply of gas by the Poulton Council in bulk to the Thornton Council upon agreed terms. Protection in regard to bridges and other property is given to the Lancashire and Yorkshire and London and North-Western Railway Companies. Power to purchase land by agreement to the extent of 5 acres is conferred. The price to be charged for gas is limited to 4s. 6d. for a commodity of 14-candle power. The modern conditions as to testing have supplanted the old ones given in the Bill. The excess charge for prepayment supply is to be 10d. including meter and fittings, and 6d. for meter alone—the 6d. replacing the 15 per cent. mentioned in the Bill. Discounts are not to exceed 10 per cent. for prompt payment, and 15 per cent. to large consumers or for motive power. Borrowing powers are to be the sums requisite for the purchase, together with

£15,000 for the acquisition of lands and for the construction of gas-works, and £1500 (£3000 was requested in the Bill) for working capital. With the approval of the Local Government Board, further money, as required, may be borrowed. The period of repayment has been reduced from the 40 years suggested in the Bill to 30 years for the amount borrowed for the purchase and transfer of the works, to 35 years for the sum needed for the purchase of land and the construction of works, and to 10 years for the working capital granted. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

A small part of the Todmorden Gas Act has reference to the supply of gas and electricity; but the clauses are of ordinary character—giving the Corporation power to refuse to supply gas and electricity where consumers are in arrear; providing for the specification, inspection, &c., of the pipes, &c., between mains and meters; and empowering the Corporation to decline a stand-by supply of electricity to premises having a separate supply, unless the consumer agrees to pay the Corporation such minimum annual sum as will give them a reasonable return on the capital expenditure, and will cover any other standing charges incurred by them to meet the possible maximum demand for those premises. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

The Wolstanton District Council Gas Act confirms the agreement to purchase the Chesterton Gas Company's property by the Council for the sum of £2600; and the winding up and dissolution of the Company is provided for. Under the terms of the Acts of the Burslem Local Board and the Newcastle-under-Lyme Corporation of 1877, the Wolstanton Council now also take power to purchase the mains and other works belonging to the two Corporations within their district. All the requisite authority for carrying on gas-works is included in the Act. Sanction to purchase up to 10 acres of land by agreement is granted. The rate at which gas is to be supplied is not to exceed 4s. per 1000 cubic feet. The illuminating power of the gas is to be 14 candles, tested by Harcourt's 10-candle pentane lamp, the table photometer, and the Wandsworth burner. There does not appear to be authority to adopt any other burner even with the approval of the Board of Trade. Gas in bulk may be obtained from the Burslem and Newcastle-under-Lyme Corporations. The Staffordshire County Council have obtained protection in respect of road works. Excepting in regard to mains and pipes already laid, the County Council are not to be liable for any injury done, through the use of any steam or other roller, to any mains or pipes or other works laid at a less depth than 2 ft. 6 in. below the surface of the road. In addition to the £2600 required for the purchase of the Chesterton Gas-Works, the Council are authorized to borrow the requisite sums for the purchase of the mains and pipes of the Burslem and Newcastle-under-Lyme Corporations, £25,000 for the extension and improvement of the works, and £2000 for working capital. The period for repayment is to be thirty years, save for the working capital, and in that case it is to be ten years. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

The Cumberland Electricity and Power Gas Act confers powers for the supply of electrical energy and power gas within an area comprising Workington and Whitehaven, the urban districts of Aspatria, Maryport, Cockermouth, Harrington, Arlecdon and Frizington, Cleator Moor, Egremont, and Keswick, and the rural districts of Cockermouth and Whitehaven. The powers of electricity supply usual in such cases are allowed. As to power gas, the obligation to supply is provided for; and every owner or occupier of premises requiring a supply, it is arranged, shall enter into a written contract (if required by the Company) to receive and pay for a supply of power gas, for a period of at least five years, sufficient at the rates agreed upon to pay 20 per cent. per annum upon the cost specially incurred by the Company in laying or enlarging their mains or pipes for the purpose of such supply. A great number of clauses incidental to the supply give the Act bulky dimensions. Provisions respecting supply by proportional meter, specifying that the gas is not to be used for illuminating purposes, arranging for a distinctive and readily perceptible smell, giving the Home Secretary authority to make regulations, and arranging for the penalty testing of the thermal value and composition of the gas, are included. The minimum heating value of the gas is to be 80 B.Th.U. per cubic foot. The capital of the Company is to be £450,000, with one-third borrowing powers; but not before £50,000 has been subscribed, and £25,000 paid up, will it be lawful for the Company to put into force the powers of the Act. Protective clauses of various kinds have been obtained by the local and railway authorities concerned. The prices for power gas are expressed at per "gas unit," meaning 1000 cubic feet of a calorific value of 100 B.Th.U. A standard charge for service at the rate of 10s. per indicated horse power per quarter, or equivalent thereto, for heating purposes for which the Company are required to make provision, is authorized; and, in addition, a charge per gas unit for the quantity actually supplied at the following rates: For the first 1000 units consumed in any quarter, at the rate of 3d. per unit; for all units consumed between 1000 and 10,000, at the rate of 2½d. per unit; between 10,000 and 20,000 units, at the rate of 2d. per unit; between 20,000 and 50,000 units, at the rate of 1½d. per unit; beween 50,000 and 100,000 units, at the rate of 1d. per unit; and in excess of 100,000 units, at the rate of ¾d. [*Parliamentary Agents: Messrs. Torr and Co.*]

EXAMINATIONS IN TECHNICAL CHEMISTRY.

It may be in the recollection of some of our readers that the Council of the Institute of Chemistry resolved a short time ago to hold examinations in the industrial applications of chemistry, and to grant certificates in respect thereof. The examinations were to be open to Fellows only, and to those Associates who had been registered for at least a year; and the candidates were required to produce evidence of practical technical training, and of the possession of a general knowledge of chemical technology. The examinations were to comprise the application of well-known chemical and physical laws to industrial operations; the development, control, and transmission of power and heat; a working knowledge of the operations and plant of which general use is made in industrial works for the treatment and handling of materials, finished products, waste products and effluents, including a practical acquaintance with fittings and stores; the properties of materials affecting their application to the construction of plant and apparatus in chemical works; some ability in interpreting drawings of chemical plant and in making dimensioned rough sketches; and, finally, the calculation of working costs, and a general knowledge of the clerical work connected with manufacturing operations. The Chairman of the Examinations Board is Dr. Ludwig Mond, F.R.S.; and among the members are Mr. George Beilby, Mr. Charles Carpenter, Mr. R. Forbes Carpenter, Dr. Percy F. Frankland (the President of the Institute), and Mr. R. Meldola (the President of the Chemical Society—Dr. Harold G. Colman being one of the additional examiners, for "Gas Manufacture."

The first examinations were held from the 16th to the 18th inst.; and the three candidates who presented themselves selected respectively "Gas Manufacture," "The Oils and Fats Industry," and "Steel Manufacture." The papers set on the first day of the examination referred to these industries. It is with the first subject only that our readers are specially concerned; and therefore we give a summary of the papers. The one set for the morning work contained three questions, of which the candidate was required to answer only two, and he was allowed three hours for it. The first question related to horizontal through retorts; and the candidate was asked to indicate by sketches the essential points in design and construction, and describe fully the method of working necessary to ensure good and even heating, with simultaneous economy of fuel. The second question related to the physical and chemical changes which take place during the process of condensation, including the whole treatment of the gas from the time it leaves the retort until it enters the ammonia scrubber. He had to describe the impurities and the best means to carry out such condensation in order to remove all undesirable impurities to a maximum extent, and to retain as far as desirable the vapours of low-boiling hydrocarbons. In the third question he had to describe and sketch the construction of a modern plant for the distillation of ammoniacal liquor and the manufacture of ammonium sulphate, and to include in his answer the approximate composition of, and method of dealing with, the waste liquor, waste gases, and "devil liquor" to avoid nuisance arising from any of these sources, He was asked to state to what cause the formation of "blue" sulphate is due, and how its production may be avoided.

The afternoon paper also contained three questions, of which two were to be answered in the three hours allowed. The candidate had to discuss the principles and practice of the determination of the illuminating and calorific power of purified illuminating gas, with special reference in the former case to the conditions under which the gas must be burned to obtain a fair comparison of gases of different value; also to describe the means he would adopt to carry out a complete analysis of purified gas, and to determine the amount of impurities in crude gas. He was asked to sketch and explain, without unnecessary detail, the general construction of the plant for the manufacture of "blue" and carburetted water gas (not including condensers, purifiers, blowers, pumps, &c.); describe the chemical and thermal changes taking place with regard to the water-gas reaction during the "blow" and the "run;" and explain fully the manner in which he would carry out the manufacturing process—giving his reasons for the procedure adopted. Finally, he had to discuss the question of the most suitable quality of gas for supply, under present conditions, to a manufacturing town, having regard to the use of the gas for light, heat, and power, and the competition experienced from other sources; and to give fully his reasons for the opinions expressed.

On the second day, two papers in general chemical technology were set; and on the third, each candidate was examined *vivâ voce* by the Board with the assistance of the additional examiners. Questions were put on general chemical technology and on the technology of the industry selected by the candidate; this part of the examinations including the interpretation of plans of plant and machinery.

Of the three candidates who submitted themselves for examination, only one satisfied the Board, and we are pleased to record that it was Mr. James M'Leod, F.I.C., the Chief Chemist to the Glasgow Corporation Gas Committee. Mr. M'Leod is the President of the Scottish Junior Gas Association (Western District); and in the "Journal" a fortnight ago we gave the instructive address with which he opened the new session.

CITY AND GUILDS OF LONDON INSTITUTE.

The "Gas Manufacture" Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) an advance copy of the report on the work of the department during the past session. We extract therefrom a few general particulars, as well as those relating to the examinations in "Gas Manufacture," in which our readers are more specially interested.

At the last examinations in technology, 20,610 candidates were presented from 444 centres in the United Kingdom; and of these 11,665 passed. By including the candidates from India and the Colonies, and those for the teachers' certificates in manual training and domestic economy, the total number of examinations was 22,147. These figures show an increase on those of every previous year. Compared with 1904-5, the number of subjects in which examinations were held was the same; but that of the separate classes was 219 higher—the rise being from 2601 to 2820, which is the largest on record. There was a marked increase in the number of students in attendance—44,468, compared with 41,618. A rather smaller proportion presented themselves for examination; and the percentage of passes fell. The increase in the number of students was most marked in mechanical engineering, in which subject there was a rise from 1742 to 2302; and there was a corresponding increase in the examinees. The results, however, were less satisfactory; the number of passes having fallen from 839 to 740. In electrical engineering, 5443 students were returned as in attendance in 264 classes; the corresponding numbers for 1904-5 being 5775 and 250. Though the number of examinees in subjects involving the application of chemistry is invariably less than in the mechanical trades, there was an increase last year in some of these subjects.

Coming to the examinations in "Gas Manufacture," the report shows that there were 29 registered classes, with 548 students in attendance, 438 candidates, and 323 passes last year, compared with 22 classes, 307 students, 298 candidates, and 228 passes in the preceding year. In the Honours grade, 31 passed in the first class, 50 in the second class, and 40 failed; while in the Ordinary grade the passes were 102 and 140 respectively, and the failures 75. There were consequently 323 passes and 115 failures, or 26·2 per cent., compared with 70 failures, or 23·4 per cent., in the year 1903-4. Of the total number of students in "Gas Manufacture," 41 attended classes at the Regent Street Polytechnic, which are conducted by Mr. Walter Grafton, F.C.S. Of these, 33 went up for examination, 26 passed—12 in the Ordinary and 14 in the Honours grade—and two obtained prizes. In the Colonies, one candidate in Melbourne was unsuccessful; but two in Auckland, New Zealand, passed in the Ordinary grade, and one in Wellington, in the Honours grade.

Reporting upon the work of the students, the Examiner (Mr. A. F. Browne, of Vauxhall) says: "The results of the examination are satisfactory. Excellent papers, testifying to sound knowledge of the subjects dealt with, have been numerous in both grades, especially in the Ordinary. To this it must be added that the resolute manner in which the junior candidates addressed themselves to a disconcerting paper is deserving of praise, and that results have proved the knowledge possessed by the majority to be much wider than the limits of the current syllabus. The questions set in the Honours grade appear to have been a severer test of the candidates; but the same determination to master them was clearly shown in the papers. The results point to the existence in both grades of a wide difference of degree in knowledge between candidates obtaining first-class passes and candidates failing to pass at all; the difference being so serious that it appears impracticable to make adequate allowance for it within the limits of sets of ten questions."

In the "Journal" for the 1st of May, we gave the papers set in the two grades; and the names of the successful candidates were published in the number for the 26th of June—those of the prize winners being given in the issue for the 29th of July.

A New Industry for Derby.

We are informed that the Sharon Chemical Company, Limited, of Derby, have acquired the patent and are about to put down plant to work up, by Dr. Wülffing's process, the ferrous liquors obtained as a bye-product in tin-plate works, wire-mills, and similar establishments. The process is adapted to treat either sulphate or chloride liquors; the last named being those produced at Ambergate, whence the Sharon Company will derive their main supply for the Derby works. The great importance of Dr. Wülffing's process is that all the products obtained are valuable. Thus the Company will produce from these liquors muriate of ammonia and a magnetic oxide of iron of a blue-black colour useful for making paint to protect structural ironwork. A point of much interest to our readers is that a solution of ammonia obtained by the distillation of gas liquor is the chief agent employed in the process. There is very little loss of ammonia in the manipulation; so that it is practically all recovered in the valuable form of muriate.

THE VALUE OF STUDY AND RESEARCH.

By Thomas Newbigging.

[An Address Delivered to the Yorkshire Junior Gas Association.]

Mr. President and Fellow Members of the Gas Industry,—When your President, Mr. E. J. Sutcliffe, asked me to give an address here to-day, I willingly consented to do so. In considering what the purport of that address should be, I came to the conclusion that some words of encouragement and caution, with a few general suggestions, would better engage your attention than the limiting of myself to any special department of our work as gas manufacturers. It is the privilege of age and experience to be didactic; and perhaps the old man could not be better employed.

I will not, then, deal with any special department of a gas manager's duties—nay, I often feel willing to sit as a listener at the feet of some of you. I, rather, on the present occasion, choose to offer you some remarks of a suggestive kind that may act as an incentive to study and research in the line of industry, which you, either by accident or of set purpose, have selected as the means of earning your living, and—shall I say—of making a reputation. The number of young men, and even of those more advanced in life, qualifying themselves for the management of gas undertakings has greatly increased of late years. Perhaps there is scarcely room for all who have aspirations in that direction; for, unfortunately, the number of positions, at home and abroad, is limited. It would almost appear as though there were not cherries enough to go round. This consideration, however, will not daunt the true student; and, after all, knowledge for its own sake is a worthy possession, whatever the outcome may be pecuniarily, though you can hardly dig in a promising gold mine without finding a nugget.

The gas industry is rather over one hundred years old. I have been actively engaged in it for more than half that time; and I speak from personal knowledge when I say that there are opportunities for gaining experience in these days that did not exist in years gone by. Works are thrown open for inspection that in earlier times were jealously and suspiciously guarded from the prying eyes of visitors. Schools and colleges abound for instruction in chemistry, physics, and mechanics; and in some of the technical schools there are special classes for the study of "Gas Manufacture and Distribution." It is evident that you who avail yourselves of these advantages must be laying a foundation of useful knowledge which the former generation of gas engineers and managers had to win—if they won them at all—chiefly by their own unaided efforts.

Now, I have no desire to minimize the intrinsic value of unaided effort, because I went through that mill myself; and I venture to say that what has been struggled for and fought for has a precious educational value greater than that afforded by what falls readily into one's lap. But unaided effort has often to lose time in solving problems that have already been solved; and, in any case, it will hardly be questioned that a lift on the way removes elementary difficulties, and enables the earnest student (and he is nought if not in earnest) to stand on a higher platform from which to view the problems which confront him. The mad rush after amusement which is so prevalent in these days, and which has a pernicious influence on weak minds, will not draw the devoted student. In the silence of his study, and in the turmoil of the manufactory, he will have the satisfaction of knowing that what he is striving after has an enduring value which the other lacks. These nocturnal and daily practical studies are the casting of his bread upon the waters which he will find after many days. I do not take that wise saying to mean that many days must elapse before the bread is found again, but that it will continue to be found, day by day, during as many days as we may live.

It is not for me to undervalue text-books. I well remember in my young days meeting with a pamphlet, of not more than a score of pages, on "Gas Manufacture," and how greedily I devoured and assimilated it, and derived great benefit from its meagre contents. So that I have no call to disparage text-books, seeing they are useful and even indispensable in most cases. The man who does not know his way to the sea, may take a river for his guide. Nevertheless, it is essential to success that every man's head should, to a large extent, be his text-book. Do not be content always to tread in the footsteps of others. He who relies on himself is the leader to guide the swarm. Neither be content with hearsay. That which the ear receives affects us less than what we see for ourselves. One eye-witness weighs more than ten hear-says. Cultivate, then, the habit of observation. Shakespeare has a wise saying in regard to this, as, indeed, on almost all subjects. He asks and answers a question thus—

> "How hast thou purchased this experience?
> "By my penny of observation."

We all know persons of whom it is well said, when advice or instruction is being given them: "It goes in at one ear and out at the other!" Others, again, may have a process going on before their eyes, daily, without any intelligent observation of its effects, or of trying to solve the why and the wherefore of it. They spend no thought upon it, with the result that its working leaves no more impression on their brain (perhaps less) than eating their

supper. Do not, then, be content with mere routine knowledge. It will not serve in these days. There must be a knowledge of cause and effect to insure success.

Experience is only garnered observation. It is the accumulated capital of daily and hourly observation paid into the savings bank of the brain. There is a Spanish proverb which says: "*El saber no ocupa lugar*"—that is, "Knowing does not take up any room." No man is anything the worse for the knowledge he has acquired, even if it does not immediately yield the possessor all that he desired and hoped for. *Tenha pasciencia*, it will bring its value in the end—

> "When old experience shall attain,
> To something like prophetic strain."

But some may ask: "Will this observation and experience secure me a better position than that which I now occupy?" I do not know. What I do know is, that you will cut a poor figure in any position without it. Whether it mends your position or not, you are a better man for its possession; and in acquiring knowledge and experience, we need not be always assessing their value in what they will fetch in the market. And yet I am afraid that that is often a very Yorkshire way of viewing things. Judging from my own observations in life, I believe that sooner or later, *ceteris paribus*, they will command their market value. But, again I say, the true student will pursue knowledge for its own sake, not caring unduly for the sordid interests of life. However unpalatable this saying may be to some, it is sterling truth.

But there must not only be observation, there must also be thinking; and thinking is generally pretty hard, wearing work, which only the strenuous student cares to undertake. Many are slothful where hard work requires to be done. Now let me tell you that the slothful man who succeeds is a greater rarity than a white crow. There can be no real lasting pleasure without it has been preceded or accompanied by toil. The two things are apparently (on a superficial view) different in their nature; but, depend upon it, they are linked together in a kind of necessary connection in all human affairs. And there is this consolatory reflection, that the thought and toil and exertion expended on any subject, smooth the way to future attainments. There is an inductive quality in all learning. That is to say, the knowledge of any science is a stepping-stone on the difficult road to the understanding of every other, and he who has well begun has his work half done. "Can a man by taking thought add one cubit to his stature?" To his bodily stature, no. To his intellectual stature, yes. With all reverence be it said.

I take it that most of you whom I am addressing are employees in gas-works. Well, whether you attain to the foremost position or not, the knowledge you are striving to acquire will, at least, enlarge your views and supply food for your minds, in that way adding to your capacity for wider intellectual enjoyment than if you had been content to perform your several duties by rote, or as mere machines without the power of discrimination. Cicero, in one of his orations, says: "When you are aspiring to the highest place, it is honourable to reach the second, or even linger in the third rank." There is also a very old proverb which runs: "To stumble twice against the same stone is a disgrace." Now to have an intelligent knowledge of your duties will probably insure you against stumbling even once.

There has been much written in these days about "The Simple Life." Some of the advice given is good and seasonable and worth following; some of it is goody-goody; much of it is impracticable to adopt and carry out. If I had leisure and ability, I would write a book on "The Simpleton Life"—the lives that many simpletons lead. Among them I would include the frequenters of football matches—those who do not make use of that fine exercise for their own health's sake, but who on a wintry afternoon howl encouragement to their favourites, and talk of their prowess during all the ensuing week. The domino players, young and old, who waste hours and days (I am not exaggerating) in a worthless and profitless game, would have a place in my category. In the precious hours spent in the playing of dominoes, many a young man might easily learn a language. Readers of periodicals containing only what I would call the snippets of literature. Those who spend precious time in solving riddles, thinking to win prizes offered by trashy magazines The betters on racehorses who hope to win money thereby. The outside hangers-on of the Stock Exchange, thinking by speculating in stocks and shares to make a fortune. Give the cold shoulder to all such vanities. They are worse than mere time-and-effort wasters—they degrade their devotees.

I do not care to burden you with a list of things that you should study—you already know the needful subjects. Neither shall I distress you with a bewildering set of pedantic rules of conduct, which are only a weariness of the flesh, and do no good. Let me just say, and it is enough, that steadiness, thoroughness, and order are supreme qualities of the student. He who has them cannot fail of success. The things that cause worry, both in business and in other matters, arise mainly from want of order and thoroughness. At the same time, the heads of departments should beware of letting their desire for order degenerate into finicalness. To managers I would say: Do not spin a yarn to such tenuity that it breaks in the fingers. Do not overload your juniors with instructions. Do not let your injunctions run to seed. Leave something to the imagination of the junior. Leave something to his own common-sense and shrewdness. If he is not to be depended on so far, he is not worth having.

To you, as juniors, I would say: Learn obedience. Learn to obey the orders of a good master, who, in the main, is to be trusted. Let me enforce this piece of advice by a concrete example of a striking kind that will impress itself on your minds. General Gordon has been over-praised, however estimable his life was from some points of view. He has been praised by some with a view to the disparagement of others, and also by honest sentimentalists who had no ulterior motives. He defied not only his enemies, but his masters, whose injunctions, had they been followed, would have averted his tragic end, and prevented the death of many brave men. Had he been a Roman, and flourished in the days of Ancient Rome, even although he had been successful, he would have been punished, probably with death, for disobedience of orders. He was both brave and self-denying, but impracticable. And an impracticable servant is worse often than none.

In regard to the immediate work that concerns you—viz., gas manufacture, and its distribution, and the uses of gas—do not allow it to enter your heads that the cream has all been skimmed from the surface of the milk—that all questions relating to your business are so threshed out in the papers that have been read and the discussions that have taken place, and the books that have been written, that but little remains to be done and said. There is no finality in this or anything else beneath the sun. Go through the whole gamut—carbonization, condensation, purification, storage, distribution, consumption, and (may I add?) competition—and think how much remains to be known about each of them (particularly how much remains for a junior to know), and consider what a knowledge of them involves—chemistry, physics, mathematics, engineering, good business qualities. Truly, there is no lack of subjects to engage your attention. I have, indeed, been impressed in perusing the gas periodicals in observing the high quality of many of the papers read at the meetings of the different Junior Gas Associations. Will the authors of these papers and addresses fail of success, think you? I, for one, do not believe it.

There is one important thing that I wish to inculcate. It is this: Do not unreservedly accept any man's *obiter dicta*—neither mine nor those of anyone else. Put them through the sieve of your intelligence. Bring to bear upon them your practical experience and thought and knowledge, as far as these enable you to form a judgment. The herd is often apt to adopt the views of anyone making a bold assertion—right or wrong. Recently I observed that an engineer asserted that inclined retorts are out of the running as compared with machine-charged horizontals. Pity that one should be rash enough to make such a statement, which is very far from being the fact, as can easily be demonstrated. Undoubtedly, the inclined retort is one of the foremost retort-house inventions of the age—improved as it has been by some of our ablest gas engineers—dispensing both with stoking machinery and with skilled labour. I can only conclude that the opinion was given either without thought or without experience, or both.

Far be it from me to speak in anything but the highest terms of the stoking machinery—West's, Arrol-Foulis, De Brouwer's, and others. Of Mr. West, from earliest days in my professional life, I have always entertained the highest admiration—for the excellence of his machinery, not to mention his personal character. Why he has not yet had the Birmingham Medal awarded to him for his services to the gas industry, I am at a loss to know. But I desire to hold the balance fair; and surely by calling in the assistance of gravity—enabling us to dispense with intricate charging and drawing machinery—an unmistakable advance has been made in the simplification of retort-house work and in economy. Inclines may be a stumbling-block to some, and to others foolishness; but there are those whose experience tells a different story. A moral I wish to enforce here is: Don't carry your argument too far; because if it happens to be wrong, all the greater catastrophe results when the truth is made clear. At the same time, there need not be any trimming. Of the vertical retort systems, I am in an attitude of hopeful expectancy, believing that success can hardly fail to result from the concentrated efforts of so many ingenious inventors.

I could enumerate a number of special subjects in connection with our industry that, as I have already said, are surrounded with almost as much mystery as ever, notwithstanding all that has been accomplished towards their elucidation by the research bestowed upon them. I will direct your attention to a few.

The question of light retort charges or heavy, and the reasons for the preference, is an important one, and should be studied and experimented upon (which can easily be done) with a view to setting it at rest beyond cavil. This is really a question of capable working. Many things difficult in their nature are made easy by good management. Some managers can obtain an average make of 11,000 cubic feet per ton, while others are fiddling away at 10,000 feet or less, using the same coal.

The rate of the evolution of gas from different coals subjected to equal temperatures is well deserving of attention. The knowledge of this goes to determine the relative value of coals.

An investigation of the specific heat of gases, both illuminating gas and furnace gas, will repay research. It is one in which there is a wide margin of room for discovery; and it lies ready to the student's hand. The properties and the action of the recently-discovered element, radium, lend greatly increased interest to the phenomena of latent and specific heat.

The reason of the greater diffusive light-giving power of the gas-flame as compared with the electric light has never been quite

satisfactorily explained. I do not remember that the reasons of this have ever been closely investigated. It is the old question of quantity *versus* intensity. Twenty years ago, I devoted some thought to this very important subject, and even made some experiments in the hope of finding the solution. I held the theory that certain or all rectilinear rays gave out other rays, and that these angular or secondary rays or emanations were greater or more numerous in the direct rays from the gas-flame than from those of the electric light—that, in point of fact, the rays from the gas-flame had the quality of the sun's rays, and therefore the diffusive power of the latter in a minor though distinct degree.

As having a possible bearing on this subject, it is wonderful, when you think of it, how much has come to the aid of illuminating gas the last quarter of a century; and it may well be that our new acquaintance radium is destined to prove another benefactor—has, indeed, already, and for long, proved a friend though we were unaware of the fact. Radium, according to those qualified to judge, appears to be a widely diffused element in Nature, permeating almost every substance, some more, some less, accounting not only for the maintenance of the heat of the earth and the heat of the sun, but also in large measure for the diffusive quality of the sun's light. I think I am right in saying that electricity, being a force or form of energy, and not a substance, is out of the running so far as radio-activity is concerned, and that therefore, for that reason, its light differs from gas-given light in diffusive quality. Nay, it is found that the alpha rays from radium carry a positive charge of electricity; and thus even our worthy competitor comes to our assistance.

There is another subject that will repay a hundredfold all the attention that can be devoted to it. Our gas-fires for heating rooms, it must be confessed, are somewhat expensive luxuries. They can never come into general use to the displacement of coal-fires until their efficiency is backed by greater economy.

Now, I was discussing this question recently with a friend of mine, a Manchester cotton spinner, whose firm use much gas for the "gassing" of yarns. He formerly had considerable trouble with the gas supplied to his gassing-frames, owing to irregularity of pressure; and he adopted various contrivances to get over the difficulty, without much success—or, at least, with less success than he desired. At last, hearing of the Keith high-pressure gas-light, and viewing the flame so produced, he came to the conclusion that here was the very thing he required for his gassing-flame. After a good deal of ingenious contrivance, and by modifying his burners to suit the altered conditions, he succeeded in applying the principle, with the result that he has perfect steadiness of flame—an all-important *desideratum* in gassing yarns—and perfect combustion, with a consumption of gas reduced by no less than one-half. The same expedient, I understand, has since been applied in other gassing factories. It might be suggested by some that such a marked reduction—viz., 50 per cent.—in the gas consumption rather militates against the advocacy of the scheme by the gas manager. But that idea must not be accepted. Depend upon it that economy tells here as in other matters, and is only another and certain way of broadening the foundations of gas usage. The Welsbach light is a striking instance in point. There you have efficiency and economy combined, and both, too, in a remarkable degree. Indeed, it is a commonplace to say that in all processes efficiency with economy should be the watchwords.

But to hark-back to what I wished to say about the gas-fires used for heating rooms. I note that improvements are constantly being made in these; but a big stride has yet to be taken before they are entirely satisfactory from an economical point of view. That is to say, they are not as economical as they might be made if the principle of high pressure, through a different type of burners, were applied to them. That is my friend's suggestion, backed by his experience with his improvements in yarn gassing; and I am fain to think that it—high-pressure gas, that is to say—will be applied to heating stoves in the near future, with astounding results. There are some ingenious minds before me who might set themselves to solve any difficulties there may be in the application of high pressure along with the bunsen burner to domestic gas-fires. Whoever does this will not only benefit the gas industry, but will prove a public benefactor by ameliorating the smoke nuisance in our large towns.

Every junior should familiarize himself with the Ordnance Survey maps of the different scales, so that he may be able to read them without difficulty—to know the meaning and signification of the different characters in writing and printing, the various kinds of boundary lines of counties, parishes, boroughs, and urban districts, the contour lines, the level marks, and other signs. This may seem an out-of-the-way thing to recommend. But in the course of my professional career I have constantly had to deal with them. And, as a matter of fact, I have been surprised sometimes to note how ignorant some men, even in fairly good positions as engineers, are of such matters. By the help of a sheet of "characteristics" that may be obtained from the Department, a few hours' study will let one into the secrets of these maps.

The general public, and even the members of public bodies who have large municipal works to deal with, hardly appreciate the fact of the multiplicity of detail there is associated with the duties of a gas engineer and manager. These are greatly more than in the cognate departments of water and electricity. As a matter of fact, the gas manager is under the necessity of being also something of an electrician, in order that he may understand the underground force at work upon his mains and service-pipes, and how to counteract it. But notwithstanding these conditions, it is only in rare instances that the knowledge and experience which the competent gas engineer and manager possesses and brings to bear upon his work, are requited as they ought to be. The inadequate salaries that are paid to such men are no credit to those in authority, whether municipal committees or directors of gas companies. Such a niggardly policy is bad economy, as well as unfair treatment. The intelligence that is required in such a position, if applied in most ordinary commercial affairs, would insure more adequate remuneration.

One word more, and I have done. You are only one-sided youths and men if you limit your studies to the work of your profession. There are times in the lives of all of us when we desire, and even feel it necessary, to put aside the dusty details of the work by which we earn our daily bread. Variety is a necessity in every condition of life. Some secure this by the resort to profitless amusements, about which there is no permanent satisfaction. Better far aim at acquiring a knowledge of, and a love for, literature—especially the literature of our country. Such pursuit, so far from hindering you in the study and work of your profession, will be a substantial aid to you, by expanding your mind, giving it that many-sidedness which is so desirable, and enabling you to express your ideas, whether in speech or writing, in a becoming manner. The knowledge so attained will not only yield you solace in your jaded hours, but it will prove a real help to you in the performance of your daily duties. And when overtaken by age, and your professional work has to be relinquished, you will possess resources within your own minds that will banish *ennui* and yield you pleasure to the end of life's journey.

PERSONAL.

Mr. H. T. Coles has resigned his position as Water Engineer of the Taunton Corporation.

The shareholders of the Wellington Gas Company have presented the Chairman, Mr. Harry Shepard, J.P., with a handsome silver salver, weighing 150 oz., as some recognition of his many and valuable services during his twenty-eight years' association with the Company, and particularly of his successful management of affairs as Chairman for the last ten years. The presentation was made at a luncheon to which Mr. Shepard was entertained by the Directors of the Company. In thanking the subscribers for their present, Mr. Shepard referred to the good feeling existing between the Directors and the staff, and thanked them for the present made to him a short time ago. Mr. H. J. Woodfine, the Manager, on behalf of the staff, said they held Mr. Shepard in high esteem, and hoped he would be spared for many years to give them the assistance they now received from him.

Retirement of Mr. Alfred Featherstone.

There was a pleasant gathering recently at the Midland Iron Works, of Messrs. C. & W. Walker, Limited, at Donnington, when Mr. Alfred Featherstone, who has retired from the position of Managing-Director of the Company and become a member of the Board, accepted an invitation from the technical and clerical staff to be present to receive from them an illuminated address, in recognition of their high appreciation of his sterling qualities and conduct generally towards them during his connection with the firm. Mr. Hugh F. Wright, the General Manager, presided, and called upon Mr. W. Cottrell, as the member of the staff who had been longest in the Company's service, to make the presentation. In complying with the request, Mr. Cottrell said the regret felt by all at Mr. Featherstone's retirement was alleviated by the knowledge that he was not entirely severing his connection with the Company, but would still remain with them as one of the Directors. They hoped he would be spared for many years to enjoy the rest he had earned after a strenuous life, more than thirty of which had been spent in guiding and helping to build up a business which had now a world-wide reputation. They all felt that in parting from him they were losing a true friend. The address he (Mr. Cottrell) had been asked to present had been subscribed to with heartiest unanimity by all; and he had much pleasure in asking Mr. Featherstone's acceptance of it, accompanied by the earnest wish of the donors that long life, happiness, and prosperity might be his lot and that of Mrs. Featherstone for many years to come. In acknowledging the presentation, Mr. Featherstone said it was difficult for him to find words to fully express the feelings in his heart. He should treasure the address as long as he was spared, and always look upon it as a gift from old comrades and friends. They could not have given him anything he would have appreciated more highly. Mr. R. J. Milbourne proposed "The Health of Mr. and Mrs. Featherstone," and in a sympathetic speech expressed the hope entertained by all that they and their family might have plenty of joy and sunshine, and that every blessing might attend them. Mr. Walter W. Martin supported the toast, which was enthusiastically honoured. Mr. Featherstone having briefly responded, the proceedings closed with a vote of thanks to the Chairman. The address consisted of four pages tastefully illuminated and bound in red morocco leather, with a suitable inscription in gold letters on the front.

ASPHYXIATION BY COAL-GAS.

Its Prevention and Treatment in Gas-Works.

In the month of June last, an International Congress was held at Milan on the subject of diseases and maladies arising out of industrial occupations. One of the special matters dealt with was the possibility of asphyxiation of workers in gas-works, and the precautions against it, and remedies for it, that should be adopted. A paper on the subject was read by Dr. Piero Torretta, who is what might be styled the Medical Officer of Health of the Consumers' Gas Company at Turin. This paper has since been published in pamphlet form—embellished with several photographs of gas manufacturing operations at the Turin works, and of appliances adopted there to protect workmen against asphyxiation. A dedicatory introduction is suitably addressed to Signor Cav. Gioachino Fornas, who is the President of the Company's Administrative Board.

The author divides the constituents of coal gas into three categories: (1) Illuminating constituents, such as benzine, toluene, and other carburents, ethylene, and traces of naphthalene; (2) non-illuminating constituents, such as methane, hydrogen, and carbonic oxide; (3) noxious or useless constituents, such as carbonic acid, sulphuretted hydrogen, ammonia, bisulphuret of carbon, cyanogen, nitrogen, and oxygen.

To which of these substances, he asks, is due the poisonous qualities of illuminating gas? About half-a-century passed after the discovery of coal gas before physicists concerned themselves much with it. Then, in 1841, M. Tourdes, after some serious cases of asphyxiation by coal gas at Strasburg, published a paper on them, but he did not dwell on the nature of the toxicological gas. Shortly afterwards, M. Devergie attributed the danger to the hydrocarbons and the carburetted hydrogen. Others made various suggestions, till at last M. Layet, after a series of exhaustive experiments, found the cause in carbonic oxide. The amount of this poisonous gas varies considerably. Bunsen gave it as 6·64 per cent., and at Hiedelberg, 8·88 per cent.; Hempel, at 8. But even 15 to 20 per cent. might be reached. In general, from 5 to 7 per cent. of carbonic oxide may be admitted with traces of sulphuretted hydrogen and other sulphur compounds. According to researches by Fodor, the fatal dose of carbonic oxide is much lower; and it appears that 0·04 per cent. once absorbed into the blood constitutes a danger to health. On the other hand, in forensic medicine, it is admitted that death may ensue from poisoning by illuminating gas without the collecting of the gas being able to cause an explosion. So that to find a lamp burning where a person has been poisoned, does not exclude the idea of it (Hofmann). Poisoning by carbonic oxide has been the object of numerous and authoritative investigations both from the clinical and medico-legal points of view. Here we need only say that coal gas, with carbonic oxide, may act in two ways—in a sharp manner, like lightning, or in a chronic manner, slowly.

Fig. 1.—Artificial Ventilation during the Repair of a Gasholder.

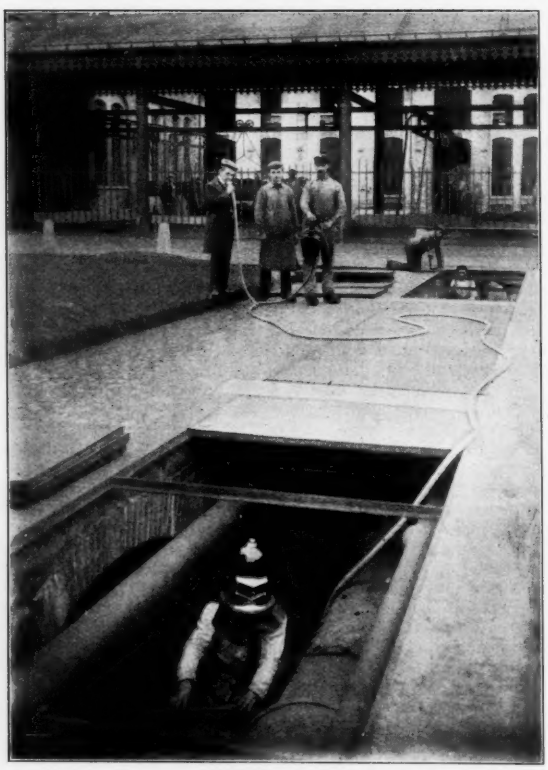


Fig. 2.—The Konig Mask for Use in Foul Atmospheres.

When illuminating gas, pure or almost pure, penetrates all at once into the lungs, the workman falls as if struck by lightning. M. Sedillot has described cases of almost instantaneous death, where workmen cleaning a pipe have breathed the gas deeply and freely. M. Bruneau, also, has referred to two cases of death by sharp asphyxiation, through workmen being lowered into a trench in which gas had collected from a hole in the main. The author himself describes an analogous experience he had at the Turin Gas-Works three years ago. The annual cleaning of the works' mains was in progress. The trench was covered with large stone slabs; the trench in question being 2½ metres (about 8 feet) deep. It was partly uncovered for a width of about 1 metre. A workman wished to enter the trench, to clean the pipe and take out the naphthalene deposits. Notwithstanding the rule of the works, that when a workmen is engaged on such a task he must have a leather band round him with a rope attached held by another man on the ground, this particular workman disregarded the instructions. Though a practical man of long experience, familiarity, as is so often the case, had bred contempt. There was undoubtedly gas in the trench, though the valve from the gasholders with which the pipe being cleaned out communicated, was shut. A few seconds after the man had gone into the trench, he made no movement, and gave no answer to his fellow-workmen on the ground-level. Then, one after the other, no less than five men went into the trench—each in the hope of rescuing his predecessor; but each fell on the other, and not one of the men gave any sign or call. With the utmost difficulty the foreman, who had come on the scene, prevented others going into the trench. They removed a second row of stone slabs, and succeeded eventually in getting the six workmen out. All except the first soon recovered their senses. Artificial respiration was tried; pure oxygen was given; ice was applied, and other endeavours made; but it was two hours before he showed any sign of superficial breathing. Artificial respiration was continued for five hours. Other methods adopted, and symptoms shown in this case are described in medical language by Dr. Torretta, who had the satisfaction, after thirteen hours, of seeing the patient show some signs of half-consciousness. In ten days' time he returned to his work completely recovered. This case is cited as showing the absolute necessity of gas-works being provided with medical and other appliances hereafter mentioned.

The author then describes the various symptoms of asphyxiation, and the after-effects and permanent dangerous consequences. He proceeds in the next place to consider the risks and precautions required in the five divisions of gas manufacture: (1) Carbonization; (2) physical purification of the crude gas; (3) chemical

purification; (4) storage; (5) distribution. As to No. 1 he says that generally no poisoning either acute or chronic occurs in the work; but in the cleaning of the ascension-pipes, a light chronic form is met with, which generally assumes the character of anæmia. In No. 2 there is no danger. In No. 3, the workmen engaged in emptying the purifiers or turning over the purifying material are liable at first to puffs, and afterwards to light but continuous fumes, of noxious gases. These are chiefly ammoniacal vapours and volatile hydrocarbons which produce morbose symptoms, quite different, however, from gas poisoning. With regard to No. 4, the storage of gas, the danger occurs during the cleaning or repairing of the gasholders or their tanks or the dry or pipe wells in connection with them. Here we may refer to fig. 1, which shows a machine in use at the Turin Gas-Works for artificially ventilating the crown or lift of a gasholder during its repair. The apparatus, which is also used for supplying pure air to workmen in trenches, consists, as will be seen, of an electric motor driving a ventilator suitably arranged upon a travelling carriage. The last division No. 5 of the cycle of operations is that of distribution. In the work of main-laying and main-cutting, it is unavoidable that some gas should escape and may sometimes cause the workmen slight and sometimes serious poisoning. Besides sharp asphyxiation, such workers are also liable to chronic poisoning, which shows itself by an habitual anæmic condition and nervous disorder.

To sum up, then. The danger of asphyxiation from coal-gas is found only among a small number of gas workmen, and chiefly of the following classes: (1) Those engaged in main-laying and the detection of leakage; (2) stokers, coke quenchers, and pipe-jumpers; (3) those occupied in the work of purification.

Fig. 3.—The Ambulance Pavilion or Sanatorium.

Dr. Torretta next proceeds to consider the preventative and curative courses to be adopted; and, naturally, he calls especial attention to the system in vogue at the Turin Gas-Works, which, however, he thinks applicable to all works whether large or small. The means to be adopted to avoid gas poisoning depend upon whether the danger lies in the acute or the chronic form. The principal preventative means are certainly the education of the workman. In the gas industry, which perhaps offers only one danger—but that the serious one of carbonic oxide poisoning—the worker ought to be taught the toxicology of the product that he is making daily, and of the risks to which he exposes himself in his work. By this simple means, many accidents could be avoided that often occur through the carelessness of the workman, which is frequently based upon ignorance, sometimes in a spirit of boasting, or in an erroneous belief in a supposed immunity from gas poisoning.

The retort-house should be of ample size, and its ventilation should be assured by numerous large openings, made both in the side walls and in the upper part of the roof. Coke quenching should be done in an ample space, with a roof open to the free air. The same applies to purification and revivification. The men who have to clean out gasholders, &c., should be specially instructed in their work. When dangerous operations are being carried out, the ambulance or other similar corps should be in attendance. Where a well or trench has to be cleaned out, in which it is known that there is stagnant or other gas, the only means of preventing asphyxiation is to isolate the workman from the surrounding foul air in which he has to work. There are isolating masks and other kinds of apparatus to effect this. One type in use at Turin consists of a mask or kind of diver's dress, into which atmospheric air is forced by a bellows. This apparatus —made by the firm of Köning, of Altona—is shown in fig. 2, and it will be noticed that it allows of verbal communication between the workman and the attendant. Another type uses compressed air; and there are many varieties of it, which need not be detailed here.

To prevent chronic forms of gas poisoning, the workman should not be kept too long in the foul atmosphere, and the hygienic requirements of personal cleanliness should be satisfied. The hours of labour should not be long; there should be an annual holiday of some days; baths should be used; and wages should be sufficient for a healthy home and good living.

Remembering that asphyxiation from coal gas is essentially caused by carbonic oxide, there are only two ways of dealing with it—artificial respiration and inhaling oxygen. It should be well known that artificial respiration can be successful after the heart has stopped beating, and that it mechanically excites the heart, and produces a movement of the blood again towards it. The sufferer should therefore be taken to an isolated room, freed from any tight clothes round the neck and abdomen, and artificial respiration at once be begun, and continued long and persistently by properly instructed persons. Oxygen should also be resorted to, and can be administered at the same time as artificial respiration is being tried.

To summarize. A gas-works to be able reasonably to fight the greatest danger that occupation in it entails—namely, that of asphyxiation—should certainly be provided with the following conveniences:—

1. It should possess an isolated and sufficiently large pavilion or sanatorium, into which those asphyxiated can be carried. Fig. 3 is a photograph of the building for this purpose at the Turin Gas-Works.
2. This pavilion ought to be furnished with: (*a*) Masks for going into enclosures containing unbreathable gas; (*b*) oxygen cylinders of at least 400 to 500 litres; (*c*) ambulances; (*d*), (*e*), (*f*) various surgical instruments and medical requirements; (*g*) woollen blankets.
3. There should be a company of workmen instructed in "first-aid" to the injured, and especially in the operation of artificial respiration.

The author concludes his paper by giving a bibliography of the subject—consisting chiefly of French and Italian treatises upon it, though one or two "JOURNAL" articles are also included.

YOUNG AND GLOVER'S VERTICAL RETORT.

The Patent Specification.

In the course of his paper read before the Institution of Gas Engineers last June, Mr. Thomas Glover, of Norwich, gave some particulars of the vertical retort arrangement patented by Mr. William Young, of Peebles, and Mr. Samuel Glover, of St. Helens; and from time to time, both before and since, other details of the arrangement have been referred to. The publication of the patent specification last week enables us now to place before our readers the reasons that lead the inventors to fix upon the particular form of plant they have designed—an illustration of which is given—and further details of its construction.

In the words of the patentees, the invention relates to the destructive distillation, or what is known as the carbonization, of coal for the production of illuminating and heating gases, and it comprises improvements in the construction of the carbonizing apparatus and the method of applying the heat necessary for the carbonizing process, whereby such heat is more effectively and economically applied and better results obtained.

The invention is based upon the principle that, when coals are carbonized, the conditions should be such that the volatile matters should be eliminated from the coals without having to pass through, and come into contact with, highly heated surfaces, and that the volatile matters, after being eliminated, should be decomposed or gasified by the action of radiant heat of a suitable temperature; contact with the highly-heated surfaces being, as far as possible, avoided, as such contact is destructive—indiscriminately and injuriously cracking up the hydrocarbon vapours evolved from the coal, the carbon of their constitution being largely deposited upon the heated surfaces, naphthalene, and other objectionable compounds being produced, and the resulting gases having, in consequence, a lower illuminating power, whereas radiant heat is selective in its action, decomposing the more complex vapours most actively, and in such a manner as to produce gas of a high quality.

The decomposition or cracking up of the vapours from the coal by radiant heat results in the carbon which is necessarily set free during the gasifying process being in a very flocculent condition which, with the carbonizing apparatus hitherto employed, is attended with the difficulty that such carbon is carried forward in the current of gas, and deposited in the standpipes or hydraulic or other collecting mains, giving much trouble; and, further, as in all retorting arrangements hitherto employed for the carbonizing of coal the temperature of the heats applied to the retorts to effect the elimination of the volatile matters from the coal, and the subsequent cracking up or gasifying of the volatile matters are the same, in practice it has been found necessary to adjust

the weight of the charge of coal in the retorts, in relation to the size of the vacant space over the charge, so that sufficient volatile matter may be left ungasified, and allow of sufficient condensable tar being produced to wash down, and prevent trouble from, that flocculent, sooty deposit in the standpipes, &c.

The present invention consists in so constructing and arranging the carbonizing apparatus that heat of different temperatures is applied to the different sections of the retorts in such a manner that the volatile matters are as rapidly as possible destructively distilled out of the coal progressively, and so that they are evolved from the coal without being exposed to over highly-heated surfaces in one section of the retort, that the volatile matters so evolved are subjected, in another section of the retort heated to a lower temperature, to the action of radiant heat suitable to decompose them into permanent gas of good quality, and that the flocculent carbon and sooty tar set free by the action of the radiant heat are filtered out and separated from the resulting gaseous matters by causing them, on leaving the retorts on their way to the collecting main, to pass through the fresh charge of coal contained in the hopper before it is charged into the retort. The hot gaseous products are not only filtered free from flocculent carbon and the grosser suspended tar, but there is also, at the same time, an advantageous exchange of heat—the gases being cooled, thereby saving condensing plant, and the coal heated and so prepared to undergo the carbonizing process. Besides this, the tarry matters previously deposited upon the coal, on entering the retorts, are gasified—thus slightly adding to the volume of the gas and improving the residual coke.

This improved carbonizing process can be most advantageously carried out in vertical or highly inclined retorts, but may in part be applied to other forms. Preference is given, however, to the employment of vertical retorts similar in construction and arrangement to the fire-brick portions of those that have been so long and extensively used in Scotland for the distillation of shale, and which are described and illustrated in the three patents granted to Mr. Young and others, No. 1377 of 1882, No. 13,665 of 1897, and No. 15,238 of 1899. These retorts are vertical and rectangular in cross section and slightly tapered (widest at the lower end) to allow the coal and resulting coke to drop through.

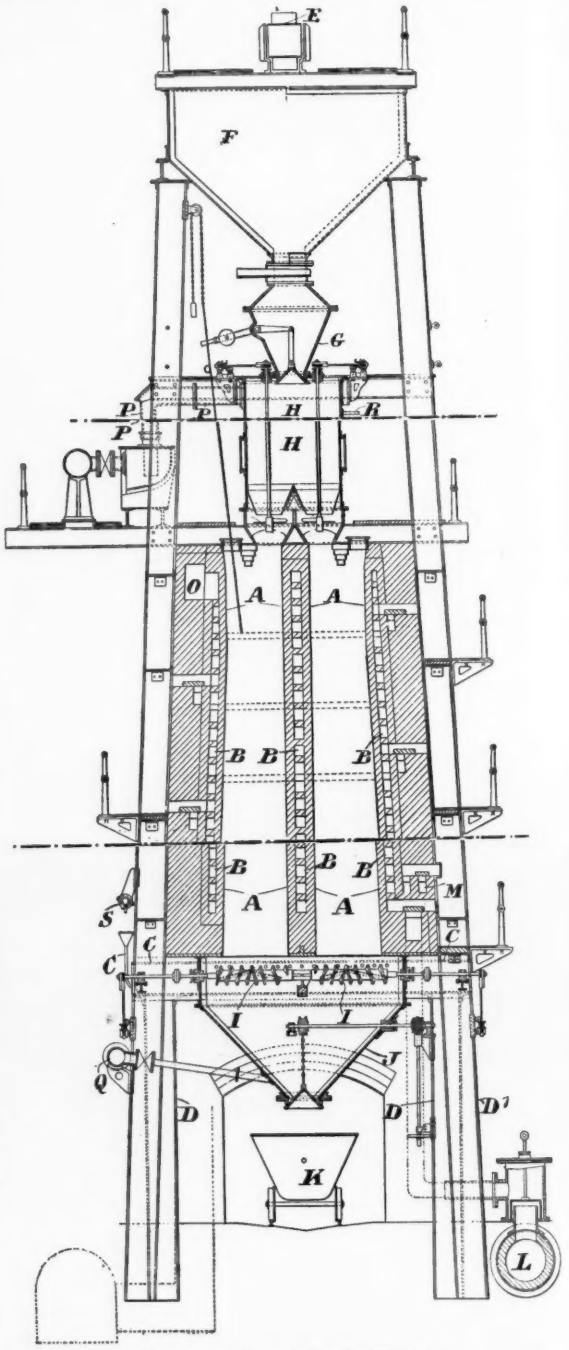
Each retort is provided with a supply hopper from which the coal is fed into the retort, and a discharging chamber from which the coke resulting from the carbonizing of the coal is discharged. The carbonizing process may be carried out by the coal being continuously fed into the retort and the coke continuously discharged, or by the coal being passed into the retort in intermittent charges and the resulting coke similarly discharged. The charging hoppers and discharging chambers are provided with suitable appliances to carry out either method as desired and as found best suited for the carbonization of the particular coal to be gasified. As a general rule, coal that softens, melts, and swells much during the carbonizing process can be best treated by the former method of charging. But whichever method is employed, the coal is fed or charged into the retorts, and the coke discharged from the retorts, so that there is maintained a relation between the portion of the retort filled with the coke, and the superposed charge of coal undergoing destructive distillation for the evolution of the contained volatile matters, and the space above the distilling charge, through which the vapours pass, and are acted upon by the radiant heat, and gasified before passing to the exit leading to the hopper containing the fresh charge of coal; the relative areas of the sections of the retorts occupied by the distilling charge and that left vacant for the action of radiant heat upon the evolved vapours being modified to suit the coal being distilled and the temperature of the heat applied. As a rule, the coal giving off the largest percentage of volatile vapours requires the largest free space in relation to the weight or size of the charge of coal.

The retorts are placed in settings of any convenient number, and are heated by producer gas, which, along with the regulated admission of secondary air, and by means of suitable flue arrangements, is so applied that the sections of the retorts in which the coal is destructively distilled are heated to a very high temperature, and the highest at the base of the charge, so that the volatile matters will be eliminated from the coal as rapidly as possible and pass inwards, away from the highly-heated walls of the retorts and upwards through among the cooler interstices in the centre of the charge of coals, and emerge from the upper surface into the higher section of the retorts, which is purposely heated by the producer gases to a lower temperature, as it has been found that the radiant heat of lower temperature is better suited to convert these vapours into gaseous compounds of good quality with the minimum production of such objectionable compounds as naphthalene, free carbon, or the like. The gaseous products, thus gasified, pass away by suitable outlet from the retort into the hoppers containing the fresh charge of coal, through which they pass, being filtered free from sooty, tarry matters, and an exchange of heat effected all as previously described.

Existing inclined retorts may be modified so as to carry out the improved carbonizing process by attaching to their upper ends suitable hoppers to contain the charges of coal through which the evolved gas leaving their upper ends is made to pass on its way to the collecting mains; and discharging chambers at the lower ends for discharging the coke—modifying the method of applying the heat to the different sections of the retorts as described in the use of vertical retorts.

Both when using vertical and inclined retorts, it is said to be advantageous to retain in their lower ends a considerable quantity of the red-hot coked coal, as it serves to revolatilize any of the volatile products from the coal that may have condensed out in their passage upwards through the cooler interstices of the central portions of the carbonizing coal, and thus prevent tarry matters collecting at the discharging doors.

When the coal employed is of such a quality as to make it desirable to dilute or reduce the illuminating and heating powers of the resulting gas, either steam or blue water gas may be passed into the lower end, and up through the retorts during the carbonizing process. The yield of ammonia is also increased by these means.



Young and Glover's Vertical Retort.

As shown, the retorts are built up of fire-brick or formed with a fire-brick lining A, around which are formed heating flues B, heated by the combustion of producer gas upon admixture with air. The brickwork is carried by hollow girders C, supported by pillars D and occasional piers of brickwork. The coals to be carbonized are delivered by conveyors E into large open hoppers F, of which one is provided for a number of retorts—the hoppers being supported by upward extensions of the pillars. At its lower end, each hopper is fitted with gas-tight valves, through which the coals are delivered into a number of measuring hoppers G, of which one is provided for each pair of retorts; and

from these hoppers the coals are dropped on opening a bell-valve (operated by a lever handle) into a drying chamber H, in which they are subjected to the heat of the gas generated below, and which, in passing up through the chamber, deposits tarry matter on the coals. At the bottom of the chamber H the coals are discharged in regulated streams by means of such devices as arms carried on shafts and arranged to sweep the coals off the surfaces of tables—a device well known in apparatus for retorting shale, and not needing to be described. From the tables the coals drop into the retorts, which are filled to about four-fifths of their height; a free space being left above, wherein the gas generated is subjected to radiant heat of suitable temperature in its passage upwards to the drying chamber H.

The coke or carbonized coal, after parting with its gaseous constituents, descends to the bottom of the retorts, and is continuously or intermittently withdrawn by means of combined right and left hand screws I carried on a rotating shaft. The devices are of a type commonly used in shale retorts; the coke dropping over the ends of inclined plates into a discharging hopper J fitted with a bell valve, which is periodically opened by a hand-wheel shaft connected through worm gearing with a shaft provided with a chain pulley and chain attached to the valve. The coke as discharged falls into a waggon K running on rails below. For the purpose of slacking the coke and keeping cool the screws which draw it from the retorts and other parts of the apparatus, water is delivered from a main S, through piping, into the hollow girders C, and is discharged through a number of orifices in proximity to the screws I. The steam thus formed passes up through and among the hot coke and charge of coal in the retorts to assist in the production of water gas and ammonia.

The carbonization of the coals within the retorts is effected by the combustion of producer gas in air; the gas being supplied through a main L, furnished with suitable valves, and being led by a conduit to a flue in the lower part of the brickwork of the retorts, while the air, which is heated by traversing a regenerator flue, is admitted through a flue M to another flue just over the gas-flue—each of these flues being provided with a moveable damper or other closure for regulating the admission.

The mixed gas and air is directed into and through the heating flues B, which are fitted with suitable baffles so that the burning gas is caused to travel entirely round the lower part of the retorts, and thence round one section after another at the higher levels.

The various parts of the retorts may be subjected to different temperatures; and to ensure regulation of the temperature, the secondary air to complete the combustion of the heating gas is admitted by flues provided with suitable dampers at various levels. The heat transmitted into the space above the coals in the retorts is less intense than that at the lower levels where carbonization is effected, and is regulated to ensure fractional cracking-up of the gas evolved, as already described.

The waste gases resulting from the combustion of the producer gas in the heating flues pass into an outlet flue O and down through the brickwork to a main discharge flue under the ground-level.

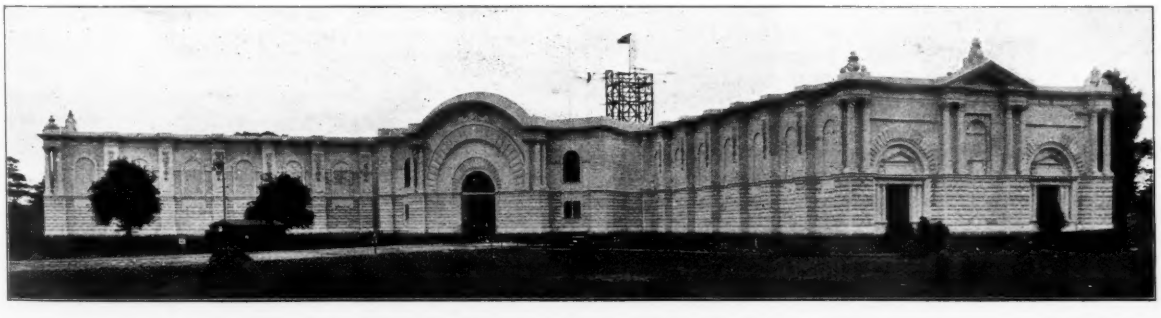
The gas generated by carbonization of the coals passes up through the fresh coal in the drying chamber H, where tarry and flocculent matters are deposited on to the coal, and thence the gas is led, by a bridge-pipe P, to the usual hydraulic main.

Steam or water gas or both may be directed through the retorts from a main Q having pipe connections to the discharge hopper J, up through the coke in which the steam or water gas (or both) flow on their way to, and up through, the retorts. When it is desired to enrich the gas, liquid hydrocarbon may be directed into the retorts through suitable inlets, as in the drying chamber at R.

The patentees claim: (1) The carbonization or destructive distillation of coals or other bituminous materials in externally heated vertical or highly inclined retorts, wherein the temperature is so controlled that the volatile matters shall be distilled or evolved out of the coal or other materials as rapidly as possible at gradually increasing or progressively higher temperatures, and that, after being so evolved, they will be subsequently subjected to the action of radiant heat from the walls of an upper section of the retort through which the whole of the gases are carried in volume, the said upper section of the retort being heated to a suitably controlled lower temperature than that of the lower section of the retorts in which they have been destructively distilled. (2) In the carbonization or destructive distillation of coals for the production of gas in the manner set forth in Claim 1, causing the gases and evolved products on their way from the retorts to the collecting main to pass through and among the raw charge of coal on its way to the retort, with the object and for the purposes set forth. (3) Apparatus for the carbonization or destructive distillation of coals or other bituminous materials constructed as described and illustrated.

NEXT YEAR'S VISIT OF THE INSTITUTION OF GAS ENGINEERS TO DUBLIN.

The Progress of the Exhibition Buildings—Proposed Visit of the Societe Technique du Gaz en France.



Central Hall (North-East View) of the Irish International Exhibition.

MATERIAL progress is being made with the construction of the buildings for the Irish International Exhibition to be held in Dublin next year, and in which the gas industry is to have a distinct section. From photographs that we have obtained from Mr. F. T. Cotton, the voluntary and energetic organizer of the gas section, it is seen, perhaps better than figures can convey, that the buildings in which the exhibits will be housed will be of extensive area and commanding in appearance. The north-east view given of the central hall carries the mind back to the architectural style of the buildings erected at the last great International Exhibition in Paris and to the subsequent display in Glasgow; and the perspective view of the skeleton work of the Power and Machinery Hall [p. 308] is expressive of the confidence of the promoters as to the quantitive and qualitative magnitude of the heavy machinery that will be exhibited.

It may be remembered that, in the digest published in the "JOURNAL" of an interesting statement, made on a recent occasion, by the Chief Executive Officer of the Exhibition (Mr. James Shanks), it was mentioned that the superficial area of the entire centre building, including the four wings, would be nearly 100,000 feet, and the area of the Machinery Pavilion 90,000 feet. A plan of the building that is to be devoted to the Gas Section, showing a ground area of 350 ft. by 100 ft., appeared in the "JOURNAL" for July 31 last (p. 344). Manufacturers who have not already booked space for this section, can obtain all required particulars from Mr. Cotton, at the head offices of the Alliance and Dublin Consumers' Gas Company, D'Olier Street. In addition to the building in which the gas exhibits will be housed, high-power incandescent gas lighting has been allotted advantageous positions for display, both within and outside the main buildings.

It will come as agreeable news to our readers—and in their pleasure we unite ourselves—to learn that efforts have already been made to ensure that the meeting shall partake of an international character. We understand that Mr. Charles Hunt, in his capacity of President, has written to the Société Technique de l'Industrie du Gaz en France, informing them of the special character of next year's meeting. In a circular-letter above the signature of M. Coze, the President of the French Society which has been sent to all the members, he says: "We have the honour of calling your attention to the meeting, and at the same time of informing you of the wish expressed by Mr. Hunt that, on this occasion, members of the Société Technique will contribute papers of some interest to our English colleagues." The exact date of the Dublin meeting will be notified in due course; and it would undoubtedly add greatly to the interest and importance of the gathering if some of our French friends were to contribute papers relating their own technical gas experience. After the

very successful and pleasant international gathering during the Earl's Court Gas Exhibition in the winter of 1904, and the subsequent publication of M. Payet's interesting and informing report upon it, it would be a particular pleasure to welcome our French friends at the Dublin International Exhibition in the summer of 1907.

The Framework of the Machinery Hall of the Irish International Exhibition.

AN OBJECT-LESSON IN LIGHTING AND HEATING BY GAS.

The decision of the Directors of the Grantham Gas Company to hold an exhibition of gas lighting, heating, and cooking appliances in the Exchange Hall for three days last week, with practical lectures on cookery by Mrs. L. Michael Smith, afforded Mr. R. G. Shadbolt, their energetic Engineer, an opportunity of giving an object-lesson in the adaptability of gas for lighting and warming rooms, as well as for culinary work.

He did this by means of a specially built flat of four rooms, fitted up with the latest appliances. It was designed by himself, and carried out by Messrs. Hockley and Co., and the general effect of their combined labours is shown in the illustrations on the next page. The entrance hall was 26 feet long, 10 feet wide, and 11 ft. 6 in. high, and it was lighted by two suspended hammered copper lanterns of antique design, fitted with green glass and inverted incandescent gas-burners. The heating was by condensing stoves of the latest Richmond and Wilson types. To the right of the entrance hall was a bedroom, 14 feet square and 11 feet high, the hammered copper fireplace of which was fitted with a Richmond "Winchester" gas-fire, while over the chimney were two of Bray's inverted incandescent burners, with art-metal brackets, fitted with a pneumatic switch. Over the dressing-table was an adjustable "Nectar" pendant, hanging from a flexible tube of burnished brass. This light was connected with a tumbler switch at the head of the bed. These switches are the invention of Messrs. G. Hands and Co. Opposite the bedroom, on the other side of the hall, was the sitting-room, which was the same size as the bedroom, and was greatly admired for the beauty of its decorative treatment. A green-tiled fireplace was fitted with a handsome Wilson "Marlborough" gas-fire; and the lighting was done by two twin brackets over the mantel, fitted with "Etna" inverted incandescent burners. The central light was a "Garnet" adjustable pendant of burnished brass, with "Etna" burner, flint-glass globe, and amber silk shade. Adjoining the sitting-room was the kitchen, the walls of which were hung with white-tiled paper. In the centre was the kitchen table, to the right a dresser fitted even with plates, and on the left a Doulton sink and drainer, flanked by a Wilson "Camden" gas-cooker, and one of their "Scarborough" boilers. The gas-fire was also of their make, and so was the hot-water circulator. The lighting here, over the mantel, was by means of two-wall brackets with Bray incandescent burner and a flexible tube cock for attaching gas-irons. The centre light was one of their "Bagby" anti-vibrating pattern. Opposite the kitchen was the bathroom, the walls of which were covered with varnished tile paper, embodying a neat design in blue. A large roomy bath was attached to one of Richmond's patent "Neptune" hot-water circulating boilers. An alternative heater also attached was their geyser and shower-bath. A lavatory basin of pleasing design was also fixed in the room, which was lighted by two heavy brass brackets over the fireplace, fitted with No. 3 Welsbach Kern burners with ground-glass globes. Over the basin was one of Hulett's patent anti-vibrating pendants, with "Etna" inverted burner in an opal shade. The heating was by a Richmond "Reform" register gas-fire.

It will be apparent, from the preceding description, that the flat was in every way an excellent exemplification of the capabilities of gas; and when we mention that its construction only occupied three days, we think it will be acknowledged that all connected with its production deserve the highest praise. The cookery lectures by Mrs. Michael Smith were well attended and were highly appreciated. On Thursday evening, the exhibitors, several visiting gas managers, and various local gentlemen who had taken part in fitting up the exhibition, had high-tea together at the George Hotel, under the chairmanship of Mr. Shadbolt; Mr. John Carter, of Lincoln, occupying the vice-chair. Owing to the remarkable success of the exhibition, and at the special request of many influential townspeople, the Gas Company made arrangements to re-open it on Saturday night at 6 o'clock, and to continue it the whole of yesterday. Mr. Shadbolt, with his courteous Assistant (Mr. Smith) and the staff of the Company, took the greatest pains to explain to visitors the advantages of the many ingenious appliances which make for the greatest comfort and convenience of home life.

Gas from Rocks and Carbonated Minerals.—MM. S. & A. Seigle have taken out a French patent for the production of gas from rocks and other minerals. Powdered carbonates of lime or magnesia are mixed with powdered coal, or these ingredients may be compressed into balls with the addition of an agglomerating material, and maintained at a suitable temperature in ordinary distillation retorts, or in producers constructed for the purpose, in such a way that in proportion as the carbon dioxide is liberated it can take up a fresh equivalent of carbon, or, in certain cases that arise, a fresh equivalent of hydrogen, under the action of hydrocarbon vapours or of fragments or powder of incandescent carbon, with or without the intervention of steam, in order to yield a combustible gas.

Sitting-Room.

Bed-Room.

Bath-Room.

Kitchen.

The Gas-Lighted Rooms at the Grantham Gas Exhibition.

REGULATING THE TEMPERATURE OF COMBUSTION IN RETORT-FURNACES.

An American Patent.

An interesting specification was issued by the British Patent Office last week, for "Improvements in Processes of Regulating the Temperature of Combustion in a Gas-Producer Furnace for Heating Retort-Ovens or for Other Uses." The inventor was Mr. H. L. Doherty, of Madison, Wisconsin, U.S.A.—a gentleman whose name is well known among English gas engineers. The patent is No. 19,716, dated Sept. 29, 1905; but the date claimed under International Convention is Oct. 25, 1904—*i.e.*, the date of the United States patent for the same invention. The objects of the invention are "to prevent or minimize the formation of clinkers in the furnace, and secure a saving in the amount of fuel required to produce a given result."

The formation of clinkers, the patentee points out, depends on the temperature; and they are formed from a partial fluxing or fusing of the slag or incombustible portions of the fuel. They are largely composed of silicon, calcium, and iron; and it has been found from experience that iron in the ash of any carbonaceous fuel produces a tendency in the fuel to readily form clinkers. The formation of clinkers can, therefore, be obviated by maintaining the combustion at a temperature lower than that required for the formation of the slag or flux. In producer furnaces for heating gas-retorts, it has hitherto been customary to introduce under the grate-bars, or into the mass of incandescent fuel in the furnace, water or steam, in order to reduce the temperature of the fuel, and thus minimize, as far as possible, the formation of clinkers in the bed of fuel, "because these obstruct the draught through the bed, and fasten themselves to the sides of the furnace walls, impeding the process of combustion and preventing the maintenance of the proper temperature in the retorts required to carbonize the coal therein."

The use of water or water vapour to restrain the rise of temperature throughout the bed of incandescent fuel is, however, objectionable, because there is loss of heat due to the fact that as the water must be heated and evaporated from or about 60° Fahr. to steam at the temperature at which the waste gases or products of combustion ordinarily leave the furnace stack and pass into the atmosphere—say, 800° Fahr. or over—there is a resulting loss of about 1400 B.Th.U. for each pound of water thus evaporated. This is shown as follows:—

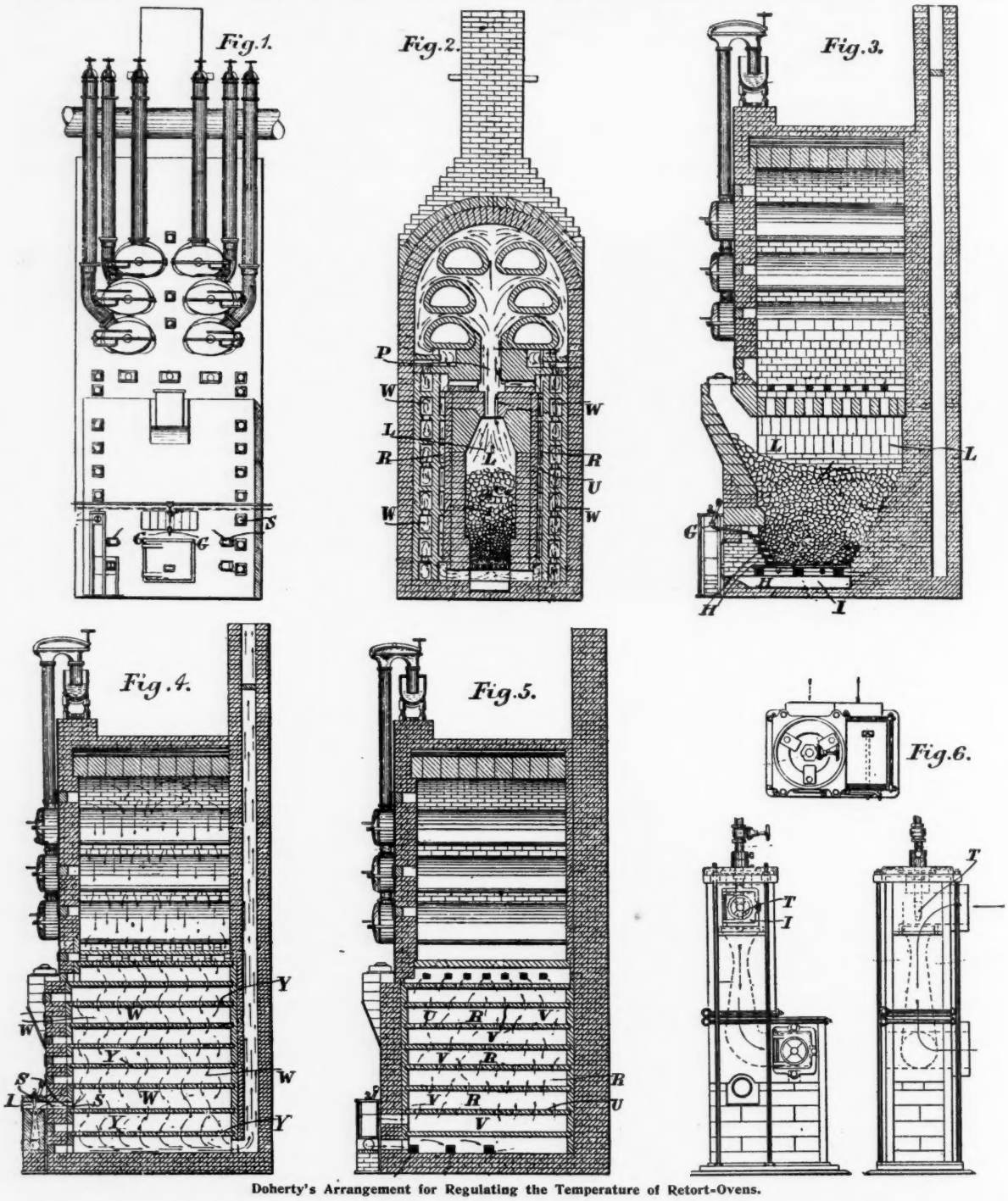
Heat required to raise 1 lb. of water from water at 60° Fahr. to 212° Fahr.	152·00 B.Th.U.
Water 212° Fahr. to steam at 212° Fahr. . . .	966·00 ,,
Steam at 212° Fahr. to steam or gas at 800° Fahr. (588 × 0·48)	282·24 ,,
Total	1400·24 ,,

The specific heat of the steam in the waste products of combustion at the temperature specified, is approximately 0·48; and in the above calculations the heat of endothermic and exothermic reactions is disregarded. It will be observed in the above determination of the heat lost, due to the evaporation of 1 lb. of water, that no account has been taken of the amount of heat required to dissociate the steam into its elements, hydrogen and oxygen, which is an endothermic reaction, for the reason that the hydrogen is again burned back to steam in the combustion chamber, which is an exothermic reaction, whereby the same amount of heat is given out as was absorbed in the endothermic reaction. For this reason, the endothermal and exothermal reactions balance each other, and have therefore not been considered in the calculation.

In addition to the loss of heat occasioned by the use of water, as illustrated above, there is yet a more serious objection to its use as a means of preventing the formation of clinkers—due to the fact that, in order to reduce the temperature throughout the entire bed of fuel below the clinkering point, it is necessary to introduce water in such a large quantity that the fuel in the immediate vicinity of the water-pans and drip-plates is reduced in temperature below that of ignition, or the temperature necessary to support combustion. The proportion of water used per pound of fuel will vary from 33⅓ to 100 per cent. As a consequence the fuel is quenched, which fact may be observed by opening the

cleaning door of the furnace while in operation and noting that scarcely any live or burning fuel is visible; the furnace presenting the appearance from below of a fire that is almost extinguished, while the fuel bed as viewed from above shows that a high temperature exists in the upper part of the mass. The unburned fuel in the lower part of the fuel bed is raked down, intermingled, and removed with the ashes, and is thus lost.

Moreover, it has thus far been found impossible in this type of furnace to entirely prevent the formation of clinkers by the use of water and steam. If enough water is used to reduce the temperature below the clinkering point, there is too great a loss of heat and fuel, while the use of an insufficient quantity of water results in an excessive formation of clinkers, attended with their accompanying evils. In view of these conditions, the customary practice has heretofore been to admit sufficient water, and (if necessary) steam in addition, so that the formation of clinkers will be reduced to such an extent that, by thoroughly cleaning the furnace at frequent intervals, the fuel bed will be maintained sufficiently free to obtain the proper amount of combustion. The clinkering of the fire is in practice attended with great labour and



Doherty's Arrangement for Regulating the Temperature of Retort-Ovens.

loss of fuel. During the operation of clinkering, the cleaning door necessarily remains wide open, permitting an excessive rush of cold air to pass up through the furnace—thus rapidly reducing the temperature of the entire structure, and resulting in an alternate contraction and expansion of all the parts, "which produces an increased leakage and reduces the useful period of the entire structure to a term of but a few years."

The present invention "entirely does away with the use of water and steam for preventing clinkering; thus obviating all the evils attendant upon their use." It consists in the employment of carbon dioxide for regulating the temperature by means of the arrangement shown. Fig. 1 is a front elevation of a full-depth regenerator coal-gas bench, having a bed of full depth; fig. 2 is a transverse vertical section; and figs. 4 and 5 are vertical longitudinal cross-sections. Fig. 6 shows a plan, front elevation, and side elevation of one of the injectors used for the purpose of withdrawing a portion of the products of combustion from one of the waste flues and forcing same, mixed with atmospheric air, under the furnace-grate. These illustrations show a gas-producer furnace provided with means for supplying water under the fuel bed in accordance with usual practice, because the patentee wishes to show how his improved process may be substituted for the old water process without changing the apparatus.

The space above the fuel bed in the chamber L is connected by

a series of nostrils with the secondary combustion chamber P, to which the secondary air supply is led through nostrils. The secondary air flues R communicate with the atmosphere at the lower portion of the furnace, by apertures controlled by dampers; and, as shown, they are provided with horizontal partitions U having staggered air flues V. These secondary air flues, together with the waste flues W, form the recuperator; and, as shown, the waste flues in this instance are arranged outside the secondary flues R, and are also provided with horizontal partitions having staggered openings Y. The waste flues communicate with the oven in the upper portion of the bench, by passages formed at the baffle-plates. At the lower portion of the bench, the waste flues also communicate with the stack by passages. The circulation of gases, after complete combustion in the secondary combustion chamber P, follows the arrows and passes from the combustion chamber up and around and between the retorts, down through the waste flues, and out through the stack, which (as shown) is controlled by a suitable damper.

A water-pipe, provided with a nozzle, empties into a cup G, from which a pipe leads to the drip-plates H. Beneath the fuel bed is a water-pan I. In the usual method in which water is used, the water is kept continually flowing through the nozzle and on to the drip-plates H, and the water in the pan is replenished at frequent intervals. In fig. 1 the mouthpieces of the retorts are shown complete, with their standpipes leading to the hydraulic main. Peep-hole fittings are provided, with removable plugs, for looking into the oven in the upper part of the bench, and other peep-hole fittings are provided for inspecting and cleaning out other portions of the bench. The waste-flues are also provided with peep-hole fittings.

According to this invention, instead of using water and steam to reduce the temperature and prevent the formation of clinkers, there is introduced into the bed of incandescent fuel a decomposable gas containing oxygen, preferably carbon dioxide (CO_2), which may be used either alone or mixed with other gases. The CO_2 is preferably intimately commingled, at or before its introduction to the fuel bed, with the oxygen used to support combustion, which latter is practically introduced in the form of atmospheric air. A portion of the waste products of combustion may be intercepted after they have been used for heating retorts, and, if necessary, after they have heated the secondary air supplied to the combustion chamber P of the furnace. This intercepted portion of the products of combustion, together with the air thus required to support combustion, is led beneath the grate of the furnace; and the carbon dioxide thus introduced passes up through the bed of burning fuel and is dissociated—forming carbon monoxide (CO). This chemical dissociation of the carbon dioxide, or endothermic reaction, absorbs heat and maintains the temperature of the incandescent bed of fuel at the desired point. Preferably no air is admitted to the top of the fuel bed in the chamber L, because the draught is upward through the nostrils to the combustion chamber.

In carrying out the process in the bench shown, passages S are provided in the wall of the bench, leading to the waste flues W, so that a portion of the waste products of combustion may be withdrawn from the flues, mixed with atmospheric air, and introduced beneath the grate through the apertures. Any suitable means may be provided for introducing the mixture beneath the grate—as for instance, an air-injector, the construction of which is illustrated in figs. 6, 7, and 8. This injector is so constructed that it may be placed against the side of the bench and registers with the openings S for withdrawing the products of combustion, and with the apertures for injecting the mixture. The injector is provided with a nozzle with which a pipe U communicates, provided with a valve V. The nozzle T injects air into the passage W; adapted to communicate with the aperture for the injection of the mixture; and opposite the nozzle is arranged a damper for regulating the supply of air for the mixture. A constant pressure of air is maintained upon the supply pipe U, and the amount of air supplied to the mixture is regulated by the damper. In carrying out the process, preferably two injectors are used with a bench of the character described—one at each side.

The specification then proceeds: I have discovered that the temperature throughout the entire incandescent bed of fuel may be kept down to a point at which clinkering will not occur, by utilizing the heat-absorbing effect occurring in the chemical dissociation of the carbon dioxide; and this is one of the essential features of the process. In carrying out the process, the mixture of carbon dioxide and oxygen should be led beneath the fuel bed at such temperature, and the proportions of carbon dioxide, free oxygen, and free nitrogen should be such, that the fuel is kept below the temperature at which clinkering occurs—heat being given up to the gases from the fuel. The temperature at which clinkering commences to form, varies from about 1500° to about 2300° Fahr., depending upon the character of the fuel and the amount of iron and silicon therein. I have found that a mixture of about 4 per cent. of CO_2, 16 per cent. of free oxygen, and 80 per cent. of free nitrogen at a temperature of about 600° Fahr. is suitable for carrying out my process with a certain character of fuel which clinkers at a high temperature; and another mixture of about 10 per cent. of CO_2, 10 per cent. free oxygen, and 80 per cent. free nitrogen at a temperature of about 700° Fahr., has also been found suitable with another character of fuel which clinkers at a much lower temperature. The higher the temperature of the gaseous mixture admitted beneath the fuel bed, the larger should be the proportion of Co_2 found in the mixture which is necessary to keep the temperature of the fuel bed below the clinkering point. I have found that the mixture of CO_2, free oxygen, and free nitrogen operates satisfactorily if injected at a temperature of from 600° to (about) 800° Fahr., in which case heat is given up to the gas from the fuel, and clinkers are not formed. The proportions above mentioned are varied by means of the dampers on the injectors. If the ordinary atmospheric air, which contains about 80 per cent. of nitrogen, is used, the percentage of nitrogen in the mixture would be the same as in the air and in the products of combustion. The percentage of nitrogen in unburned air and in the products of combustion after the air has been burned with coal are the same; the oxygen being converted, volume for volume, into CO_2 when the combustion is complete. The products of combustion are the natural source of the CO_2 used in this process, and these having about 80 per cent. of nitrogen, maintain the proportions of the mixture at 80 per cent. of nitrogen. If carbon dioxide without attendant nitrogen from any other source be mixed with the air, the percentage of nitrogen will be somewhat less. If the temperature of the mixture of air and gases supplied to the fuel bed is considerably less than the temperature of the fuel bed, the gases will in themselves (as is well understood) effect the physical absorption of some heat from the fuel bed.

In an ordinary gas-producer furnace, the temperature of incomplete combustion is usually carried on at approximately from 1800° to 2000° Fahr.; while the temperature of complete combustion carried on in the combustion chamber P where the secondary air supply is admitted, will usually be considerably higher—frequently 2500° Fahr. or more. If the gas-producer is used to heat retorts, as illustrated, the temperature of the retorts should be about 2300° Fahr.; and the waste products of combustion, after circulating round the retorts, enter the top of the recuperator at about 2000° to (about) 2200° Fahr. These products of combustion are cooled down in the recuperator before entering the chimney to between 800° and 1000° Fahr.; and a portion of the products is intercepted at some suitable point after heating the retorts, and mixed with air which is at atmospheric temperature, so that the mixture injected will range about 600° to 800° Fahr. If the gas-producer is not used for heating retorts, the products of combustion may be first led to an engine, or other suitable device, in order that they may be deprived of a portion of their heat, and be suitably reduced in temperature before their introduction into the incandescent fuel. As the appearance of the fire-bed furnishes a direct guide to the temperature that is being maintained therein, it also furnishes the best guide for proportioning the quantity of CO_2 admitted to get the lowest temperature desirable—it being preferable to admit a little more rather than a little less CO_2.

Another feature of the process resides in the fact that carbon dioxide, on account of its low thermal capacity, absorbs but little heat until the temperature of dissociation is reached, which is far in excess of that at which the fuel becomes extinguished. With the use of water, however, a large part of the heat is absorbed at a temperature of 212° Fahr. while the water is passing from water to steam, which operates to produce a quenching effect on the fuel, as before stated.

The patentee says he has illustrated the furnace provided with drip plates and water pan for two reasons—*i.e.*, to show that the process may be carried out in furnaces as now constructed, with a minimum of alteration and expense, and, secondly, to show that the new process may be used, if desired, in connection with the old water process, so that a gas of lower hydrogen content may be produced than in the old process, if this should for any reason be deemed desirable. It has been found in actual practice with this process that the saving of fuel amounts to 20 per cent. and over with average fuel.

In 1844, he points out, Jacob Reece invented a process which consisted in returning some of the gases from directly above the bed of fuel through a combustion chamber and back under the fire at an excessively high temperature—stated to be "generally sufficiently high to fuse the slag and cause it to flow in a liquid condition out of the slag-vent." One point of novelty of the present proceeds—to wit, limiting the temperature to one at which clinkers will not even be formed to any considerable amount, much less fused—will be apparent. So also in 1872 an inventor named Todd described a process for treating gases and fumes to convert them "while still highly heated;" the products of combustion in this case being constrained to "pass through and heat a transformer." Again, a British provisional patent to Kidd (No. 3174 of 1874), though apparently abandoned without being completed, sets forth that products of combustion are forced through a lower layer of fuel in a second or decomposing chamber, and soon raise the fuel therein to a "white heat" under conditions quite at variance with the present invention. This also shows the wide distinction between the production of high temperature and the limitation of the fire bed temperature which is here accomplished. Indeed, the literature of this art shows that one Blanchard has even proposed to produce "the most intense heat attainable" by introducing carbon dioxide and air at various parts of an enclosed furnace, and has stated that the upper portion of the fuel on the grate is thereby "raised to an intense incandescent heat," sufficient to permit the gases admitted below the grate to pass through without cooling the fire below the desired density. So also in smoke-consuming processes it has been suggested frequently that some of the unburned products, with, of course, carbon dioxide, be returned through the

fire bed to produce an intense and more complete combustion. Here it will be seen that utterly different objects and processes are accomplished.

Consideration of such processes, or supposed processes, will, Mr. Doherty claims, show that the present invention is radical. It is distinguished widely therefrom by the fact that he combines with a heat economy, impossible in the use of water or steam for cooling the bed of fuel, the absolute and easy control and limitation of the temperature in a remarkably even manner below that at which clinkers are formed in objectionable quantities. In short, he lowers the temperature of the fuel chamber with a great increase, instead of a decrease, of economy.

As different qualities of coal and coke vary considerably in respect to the tendency to produce clinkers, and in respect to the temperatures at which clinkers will be formed, it will be evident that fuel that less readily forms clinkers may be burned at a higher temperature under the present process, either with a less proportion of carbon dioxide introduced or with a higher temperature of the air and gases admitted.

One great cause of clinkers, it is pointed out, is that, under the old method, thin places or draught-holes occur in the fuel bed, and consequently the rush of air through this path of low resistance causes localized rapid combustion, producing intense temperature, and resulting in the rapid formation of clinkers. By the use of the present process, an opposite effect is produced, because in case there should occur a thin spot or path of low resistance to the passage of the draught, the carbon dioxide present would reduce the temperature and rate of combustion at this point, and consequently the path of low resistance would gradually disappear.

The principles of nature that underlie the process seem, he says, to be that the reduction of carbon dioxide is an endothermic reaction that absorbs heat chemically, and the introduction of a large volume of gases that do not support combustion, with the oxygen at a temperature much below that of the fire bed, absorbs heat physically; while, on the other hand, the oxidizing of the carbon of the fuel to carbon monoxide (much more if to carbon dioxide) within the fuel bed by the oxygen introduced evolves heat. Some heat is, of course, lost by transmission and radiation through the furnace walls; but this should not be considerable, and is notably less with his lower temperature. The temperature seems to be maintained constant (so far as horizontal distribution is concerned) by the equilibrium of the heat losses on the one hand, and the heat evolution on the other hand; and the process is to a large degree self-regulating, as any increase in temperature at any part of the fuel bed is opposed by an increased reduction of carbon dioxide at that spot. It is probable that less total carbon dioxide escapes from the bed than enters it, which would mean that a very considerable amount of heat energy is taken up in the endothermic reaction of reducing some of the carbon dioxide, in which event all the oxygen of the air passing through the bed may be considered and figured as converted into carbon monoxide. If so, there is the evolution of heat by the combustion of the oxygen to carbon monoxide, set against all the physical losses and against the chemical loss of all the net reduction of carbon dioxide to carbon monoxide. As this effect increases with the temperature, it follows that there is one stable mean temperature for the fire bed which will be reached and maintained for each particular proportion of gases admitted (other conditions being alike).

While the temperature at which clinkering occurs is not an absolutely definite temperature even for the same grade of fuel, the expression "clinkering temperature" is used to designate a temperature which is very much less than that at which the clinkers or slag can be entirely fused, and does not exceed that at which an objectionable amount of clinkers will be formed.

It will be seen that to a certain extent the temperature of the admitted gases and the quantity of CO_2 introduced are interchangeable factors; for the higher the temperature of the air and gas supplied, the larger proportion of carbon dioxide will be required to properly limit the temperature, and *vice versâ*. Furthermore, it will be understood that time as well as temperature is a factor in the reduction of the carbon dioxide to carbon monoxide in the fuel bed. Therefore, with an increased velocity of the gases in the fuel bed, or with an increased thickness of the fuel bed, a somewhat greater proportion of carbon dioxide is necessary than with lower velocities and thicker fuel beds. Moreover, it will be seen that the present invention can be advantageously used in many different ways, as, for example, in a large fuel bed different proportions of carbon dioxide may be introduced at different parts to maintain different temperatures.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to Messrs. Alder and Mackay's Works.

Last Saturday afternoon the members of the Scottish Junior Gas Association (Western District) paid their first visit of the season—the works selected being those of Messrs. Alder and Mackay, meter makers, of Edinburgh. Landing at Merchiston Station, on the Caledonian Railway, they were received at the works, which are close at hand, by Mr. John H. Bennet, Mr. James Hutton, and Mr. A. Mackenzie. Mr. Bennet having formally welcomed the visitors, two parties were made up; and these, under the leadership of Mr. John Gray, works manager, and Mr. John Anderson, patentee, perambulated the works.

What appealed most to the visitors was probably the number of automatically operating machines, and the excellence of the work they produced, both as to accuracy and finish. Specially notable were a series of four machines, which turned out, from brass rods, internally screwed joint tubes, stuffing-boxes, stuffing-box covers, and small screws; the mechanism being as deft in its handling and conveyance of the parts as the human hand, and so rapid as to be imperceptible to the eye. Another series of machines which attracted attention were employed in the manufacture of cash-boxes for prepayment meters; the finished product being more workmanlike than could be produced by hand. Much interest was also taken in the firm's patented arrangement for the lighting and extinguishing of gas-lamps at a distance. The apparatus works by a momentarily increased pressure of gas raising an inverted bell sealed in mercury. It was shown at work, both inside the workshops and outside; a number of lamps placed upon a high tower being lighted and partially extinguished, or totally extinguished, at will. The object of placing these lamps upon the tower is to test their wind-resisting capacity. In order to supply lamps of a satisfactory nature in this respect, the firm have begun the industry of lantern manufacture, the metal used being copper; and there were pointed out lanterns in exposed situations, the pilot-lights of which have not been extinguished for months.

At the conclusion of the inspection, the party repaired to the Caledonian Station Hotel, where they were entertained to tea by Messrs. Alder and Mackay—Mr. Bennet presiding. Afterwards

Mr. Bennet expressed the pleasure which the firm had had in welcoming them to Edinburgh. He said that if they had come a few years back they could have shown them something which would have interested them; but a good deal of the stuff which might have pleased them then was now lying in the cellars. If things went on as they were doing, the next time they came there, what they had now seen would probably have passed away, and something more interesting still have taken its place.

The President (Mr. J. M'Leod), in expressing the indebtedness of the Association to Messrs. Alder and Mackay, said it had been quite a revelation to him, as he was sure it had been to them all, to see the various processes through which the different parts went before the finished articles were produced. The machines were truly remarkable—some of them producing thousands of pieces per day. He also thanked Mr. Bennet, Mr. Hutton, and Mr. Mackenzie for their kindness. Mr. Hutton and Mr. Mackenzie made a few remarks; the former pointing out that the firm tried at all times to keep in the forefront, and he thought it could be said that to-day they were further forward in the line of progress in regard to meter manufacture than at any period of their existence.

Gas-Fired Pottery Kilns.

In the course of a paper which he read before the English Ceramic Society, at Hanley, Mr. W. F. Murray spoke highly of the results obtainable by the use of gas for firing pottery kilns. He said that though the entire advantage of gas firing could be obtained only when there was a full set of (say) ten kilns working continuously, yet some of the benefits might be secured by building, or converting, one kiln. When it was found inconvenient to work a set of kilns constantly, the kilns might be kept *in statu quo*, neither gaining heat nor losing it, by simply adjusting the admission of gas. With one kiln only, instead of a set, there would be little saving in the weight of coal used; but there would be a saving in its cost, because cheap slack or dross would serve instead of more expensive coal. Since there would be no mouths, there could be no checking of the heat, or destruction of the kiln, saggars, or ware by the sudden inrush of cold air, as there was when mouths were opened for firing; no damage by contact with the clinker and ash from coal; and the kiln would be smokeless. He estimated that a biscuit kiln, 15 feet in diameter, 9 feet high to the springing of the arch, with 4 feet rise in the crown, would with coal probably fire off in forty hours, burn 12 tons of coal, and break 100 saggars. A gas-kiln (not one of a set) of the same dimensions would fire off in thirty hours, burn 9 tons of slack, and break 10 saggars. He estimated there would be a saving by gas firing of £5. Every kiln added to the experimental round one, and worked in combination with one or more others, would greatly increase the economy, especially in time and fuel; so that, if a set of ten kilns were arranged, each round kiln would fire in about ten hours, with about 4 tons of slack. If the kilns were square, they would each fire in about eight hours, with 3 tons of slack. He calculated that, whereas the firing of a single coal-kiln of the size mentioned would cost £9 1s. 4d., the firing of each square gas-kiln of a set of ten would only cost £1 6s. 4d. He predicted that fifty years hence gas firing in potteries would be universal.

At the first meeting for the session of the Manchester Section of the Society of Chemical Industry, which will take place next Friday, at the Grand Hotel, Mr. Ernest Bury, M.Sc., will give a demonstration of Dr. Haldane's apparatus for analyzing gases.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Autumn General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham—the PRESIDENT (Mr. Fletcher W. Stevenson, of Coventry) in the chair.

The PRESIDENT having welcomed the members,

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held at Coventry on May 17; and they were unanimously confirmed.

THE LATE MR. J. S. REEVES.

The PRESIDENT said, before proceeding with the business of the meeting, he was sure the members would wish him to mention the loss the Association had incurred by the death of Mr. J. S. Reeves, of Bilston. He (the President) had not the pleasure of knowing Mr. Reeves so well as many of the members present who had been resident in the Midlands longer than he had. Mr. Reeves had been a member of the Association for a great many years. He was also a Past-President, and was for some time the Hon. Secretary. He (the President) was sure that the members would wish to convey to Mr. Reeves's family their sympathy in the loss they had sustained. He would therefore like to move that a letter be written to Mrs. Reeves, expressing the sympathy of the Association with her in her bereavement.

Mr. A. COOKE (Oldbury) seconded the motion, which was agreed to.

ELECTION OF NEW MEMBER.

The HON. SECRETARY announced that Mr. W. H. Adams, of Bilston, had been nominated for membership, and recommended by the Committee.

The nomination was unanimously endorsed by the members.

The PRESIDENT said the next item on the *agenda* was a paper by Mr. Samuel Glover, of St. Helens. Mr. Glover needed no introduction to the members, who, he (the President) was sure, would listen with the greatest interest to what he had to say.

Mr. SAMUEL GLOVER then read his paper, which was entitled

GAS-WORKS RESIDUAL PRODUCTS.

As the returns for residuals play a very important part in helping to pay for the coal supplies, it should be the desire of all gas-works managers to take any amount of trouble to work their residuals up into as many saleable commodities as their circumstances and surroundings will allow. They have got to be handled in some way; they are worth money; they should be made to realize as much money as possible; and there are those who consider that their true value has not been realized by some.

Even coke, which is the most important of the bye-products, is not cared for and marketed in the best way at some works; while in others the tar produced is looked down upon as a nasty disagreeable substance of unknown composition, and of doubtful market value. In some works, tar and liquor are sold in the condition of a conglomeration. The purchaser is left to sift the good from the bad, and turn its value into gold, which he knows how to do, because he has possessed himself of the "Philosopher's Stone." Gas liquor is often valued from an altogether incorrect basis, which makes it seem stronger when most heavily loaded with impurities. The author agrees with those who consider that an ammonia basis is the one upon which ammoniacal liquor should be valued. Gas-works managers are, however, not the only persons who have not fully realized the true value of sulphate of ammonia, and coal tar and its products.

It is a most hopeful sign of the times that people whom it most concerns are awaking to the great future that awaits nitrogenous compounds, of which sulphate of ammonia is the important one to us as coal carbonizers, and to the importance of suitable road-material-binding-compound for the motor age just dawned, of which coal tar properly distilled is, in the author's opinion, the best one. He considers that the whole gas industry is indebted to those who are working so assiduously to bring about this awakening, as it is his opinion that future gas-works carbonizing processes will increase the proportionate production of sulphate of ammonia and considerably decrease the production of coal tar.

The following is a quotation from a paper devoted to the interests of agriculture, upon reviewing (under the heading of "Manures") the recently published report of the Chief Inspector of Alkali Works as to the total production of sulphate of ammonia in the United Kingdom :—

> Production of Sulphate of Ammonia.—The Chief Inspector of Alkali Works has supplied the agricultural world, through the Board of Agriculture, with a return of the amount of sulphate of ammonia produced; that particular preparation of an alkali being of very great importance as a fertilizer of agricultural land. The following has been the production the last three years:
>
> | | 1905. Tons. | 1904. Tons. | 1903. Tons. |
> |---|---|---|---|
> | Gas-works | 155,975 | 150,208 | 149,489 |
> | Iron-works | 20,376 | 19,568 | 19,119 |
> | Shale-works | 46,344 | 42,486 | 37,353 |
> | Coke-oven works | 30,732 | 20,843 | 17,438 |
> | Carbonizing works | 15,705 | 12,880 | 10,265 |
>
> It is somewhat to be feared that these details may prove irksome to the average agriculturist. None the less, they are worthy of his attention; for they show that the fertilizer in question is derived from five leading sources, and that in all of them there is increasing production. The fact that the increase is in all five cases steadily progressive is obviously more important than if there were fluctuations. A good supply of sulphate of ammonia is of considerable consequence to the farmer.

This opinion, coming from such a source, is one of the signs that the value of sulphate of ammonia is being more clearly realized.

Any careful consideration of our bye-products must, of necessity, lead us back to the source whence both they and our chief product come—the coals we carbonize. We must consider these in relation to our needs as gas-makers first and foremost, and next in importance as coke-makers; and we find that so long as we have to consider these two chief products, we discover that coals which are nearest to the gas-works, and possibly lowest in price per ton, may not be the cheapest when all is looked at.

The gas-works managers of the Midlands are credited throughout the country with having realized and understood the important part that sale of coke plays in the healthy portion of their balance-sheets; and this is owing to the careful way in which they prepare good qualities of coke for the needs of their several manufacturers.

Having admitted that gas is our chief product, and coke the first in importance of the bye-products, we might pass briefly in review the other bye-products of gas-works. We find a considerable list of products which enterprising gas-works managers are turning to more profitable account than ever has been done before, until some gas-works have become full of interest both for the manager and for all who have to assist him; and it is said of some few of our gas-works that they are more like chemical engineering works than an ordinary gas-works. The surroundings and circumstances of each works must, however, be taken into account before it can be decided what is best to be done in any particular town.

The author mentions processes for dealing with gas-works residuals, in addition to those in actual use at the works with which he is most closely connected, in order that if there is any member seeking knowledge upon any process for the working up of any of the numerous gas-works residual products, the questions raised may be answered to-day, or, if not so, then the need for information may be elicited, and a full and satisfying answer provided in the future, either by the President or some other devoted member of the Association.

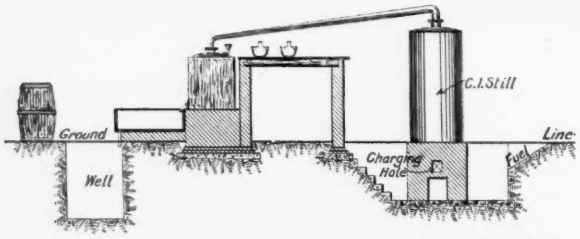
Ammoniacal Liquor.—The ammoniacal liquor may perhaps be placed at the head of this list, as being next in importance of our bye-products after the coke. This may be dealt with in the following ways.

Ammoniacal liquor may be marketed in its crude condition or concentrated as in some works to reduce the cost of transportation to where it is required to be used. Where, however, the markets would justify the putting down of the plant, it may be distilled for the production of chloride or muriate of ammonia [samples of which are on the table] for galvanizing or electrical purposes, nitrate of ammonia for the manufacture of explosives, or carbonate of ammonia which is used for many purposes, including the making of baking powders and self-raising flour.

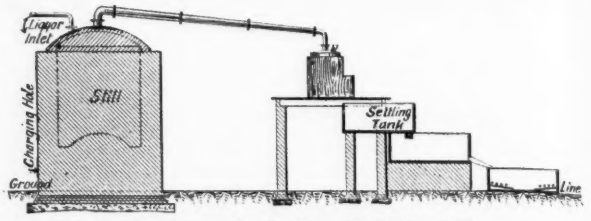
One enterprising gas-works engineer in this country, in constructing his bye-products works, provided apparatus so that he could put to work such part of it as would be needed to make the compound of ammonia for which there might at the time be ruling the best comparative market price; and the author is acquainted with a concern where it is proposed to put down, alongside a coal carbonizing gas-works plant, apparatus for the production of anhydrous liquid ammonia for refrigerating purposes.

The author's most extensive experience has been in the manufacture of sulphate of ammonia by various processes; and he proposes to include in these notes a brief description of what could be offered as a model sulphate plant, the size of which might be varied to suit the requirements of any individual works, with the exception that after a certain size is reached the author would prefer in practice to have the still, saturator, heater, drainer, and liming apparatus in duplicate, of suitable size, rather than be dependent upon one single piece of apparatus.

The diagram shows that the plant consists of the following parts. A cast-iron combined still, having the upper portion arranged for the removal of the free ammonia; the middle for the liming of the liquor after the removal of the free ammonia; and the bottom portion of the still for the removal of the fixed ammonia after the liming. The still is fitted with superposed trays and hoods; and each tray is arranged to baffle liquor as much as possible, and throw it on the serrated edged hoods, for the purpose of freeing and removing the ammonia from the liquor. The still is fitted with external overflows to facilitate cleaning. This still is supplied with heated liquor from the heater; the liquor being raised to boiling point by means of the waste gases from the saturator. The heater is supplied with cooled liquor directly from the liquor regulating tank, which is arranged with a suitable ball-cock for adjusting and governing the amount of liquor required in the plant. This heater is fitted with either



Old Apparatus for Use with B.O.V.—A Cast-Iron Intermittent Still.



First Apparatus for Use with Pyrites Acid.

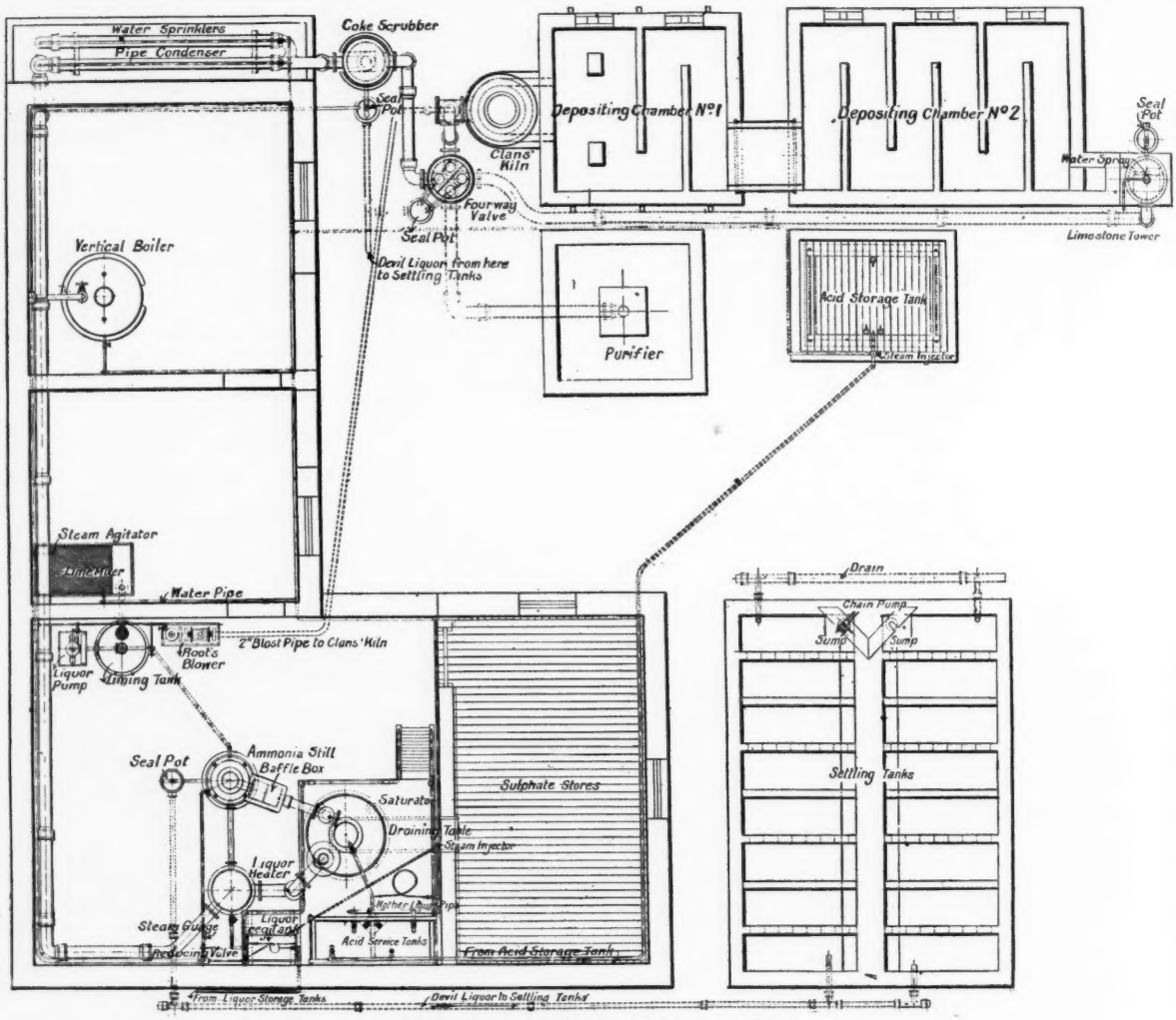
cast-iron or steel pipes, through which the liquor gravitates. The still is connected with the saturator by a suitable pipe with baffle-box, through which the ammonia and other gases pass on their way to the saturator. The baffle-box is fitted with a suitable baffle-plate for arresting any aqueous vapour that may be carried forward from the still to the saturator.

The saturator illustrated is one of the modern forms of bottom-discharge saturators, and is highly-adapted for medium plants of the size shown; and the author thinks it is far preferable for saturators arranged with steam-ejectors, as the plant can be worked without making so much mother liquor, and the sulphate is always of good merchantable quality. The saturator is made of specially hard cast-iron plates, and is lined on the inside with chemical lead sheets, which are inserted between the vertical and horizontal plates. The bottom of the saturator is fitted with a discharge funnel and valve, through which the sulphate is discharged as required on to the draining table, where it dries, and is then thrown forward into the stores. The sulphate that is made is capable of being bagged and sold after remaining in the stores for two or three days. The waste gases, containing carbonic acid, sulphuretted hydrogen, and other gases, leave this saturator and pass through a baffle-box before entering the shell of the heater. This baffle-box is provided for arresting any free acid that may be carried forward mechanically from the saturator. The waste gases are then carried forward to the cast-iron horizontal pipe condenser, where they are cooled down to normal temperature before entering the kiln of the sulphur depositing plant.

The arrangement shown enables the gases either to be passed into the kiln of the Claus plant or bye-passed into the purifier. The gases discharged from the condenser pass into the upper portion of a wrought-iron kiln, arranged with a suitable fire-brick grating on which is supported the necessary oxide of iron for sustaining the heat in connection with the action that takes place when the sulphuretted hydrogen, together with the necessary amount of air, is driven forward into the kiln. The hydrogen of the sulphuretted hydrogen unites with the oxygen of the air forming water, and leaving the sulphur free to be deposited in the chambers of the plant.

The air-blower for delivering the necessary amount of air to the kiln is placed in the sulphate of ammonia house, so that the men in charge of the plant can give the necessary attention. The air-tube between the blower and kiln is fitted with the requisite valves for regulating the amount of air required. The sulphur depositing chambers are divided into two portions. The first portion is arranged so that it can be suitably braced together with buckstays and rods; and in this first chamber is deposited most of the sulphur which comes away from the kiln in a molten state. The second portion of the chambers is arranged for recovering the flowers of sulphur; and they are thus separated from the molten sulphur recovered in the first portion. The gases, after leaving the chambers, are treated in a cast-iron tower containing limestone, down which a small stream of water flows, for the purpose of arresting any sulphurous acid which may be carried forward, due to an excess of air in the kiln.

The waste gases, after leaving this tower, pass to the hydraulic



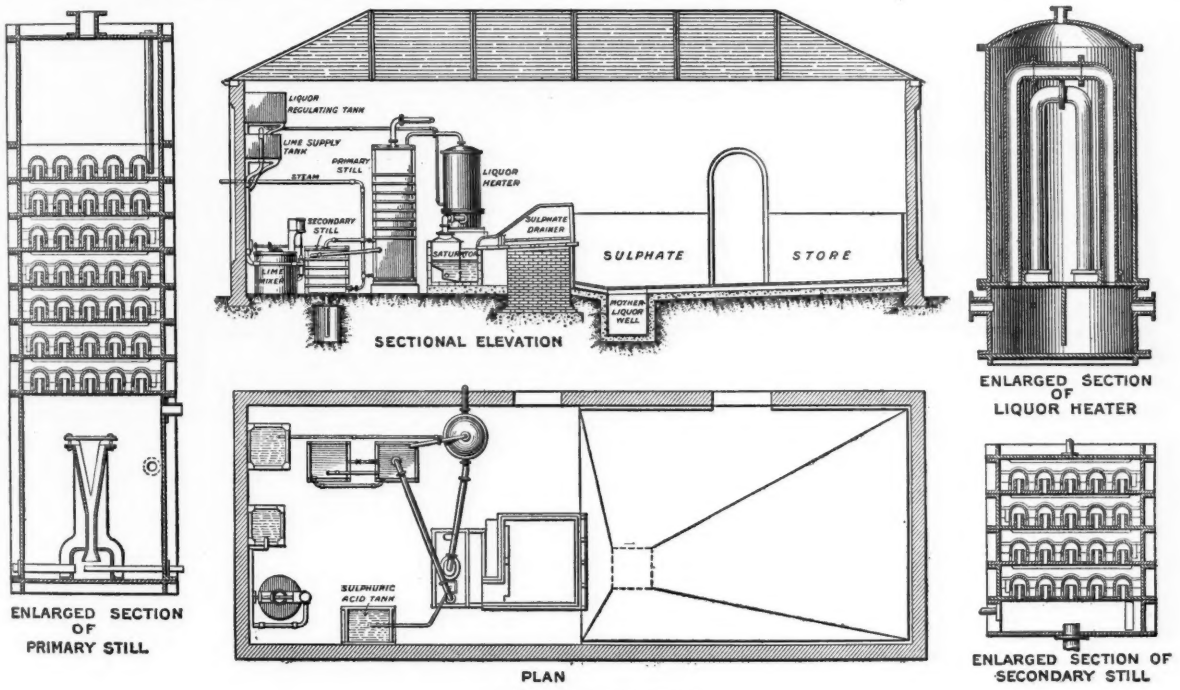
Sulphur-Recovery and Sulphate of Ammonia Plant.

change-valve, and forward to the oxide purifier, where any sulphuretted hydrogen that may have got forward (due to an insufficiency of air) is arrested. It will be noticed that the purifier is arranged so that the oxide is in one heap, and there are no sieves used for supporting it. This is found far better than providing sieves for supporting the oxide, as it works more satisfactorily. It will also be noticed from the general arrangement of the sulphate of ammonia plant, that a house is provided for the vertical boiler which supplies the plant with steam. Also there is a liming-house with a lime-mixing tank where the lime is mixed with water; the mixer itself containing a specially adapted arrangement for agitating with steam and water. The lime-water, after mixing, passes by means of a pipe into the liming-tank of the liming apparatus in the sulphate of ammonia house. Here the lime is agitated by means of a machine attached to the horizontal shaft of the small "Cameron" type pump, which pumps the lime-water into the liming chamber of the still.

The saturator of the plant is so arranged that a suitable platform can be placed round the upper portion for testing and other purposes. Two special service tanks are fixed on this platform—both connected to the acid storage tank, which is placed in the yard. To this acid storage tank is fitted a suitable steam-injector which raises the acid into the service tanks, to be there mixed with the mother liquor which has been raised to these tanks from the mother-liquor tank under the draining table and also the drainage from the sulphate store. Two charges of mixed acid and mother liquor could, therefore, be stored in these tanks for the use of the men working on the night shift.

It is claimed that by means of this plant perfectly white sulphate can be obtained from ordinary commercial sulphuric acid, and there is no likelihood whatever of producing blue or slightly blued salt. This is due to the fact that all the pipes from the outlet of the saturator are of large size and suitable bore, and that no back-pressure is, therefore, put on to the saturator—one of the main causes of the production of blue salt in many works. Another cause for the production of blue salt which has been noticed by the author in some plants, is the insufficiency of steam employed in the plant with a view of proving that the minimum amount of fuel can be used. There is no greater mistake in sulphate making than this, as it leads in many instances to a "starved saturator" and the production of blue salt, and blue mother liquor, which cannot be removed for some weeks; and the saving of fuel is infinitesimal.

The spent liquor from the still, after the removal of the whole of the ammonia, passes through the syphon-seal, as shown on the diagram, and then is discharged into the settling tanks, where the whole of the lime sludge is deported—the tanks being worked alternately. When there is a sufficient accumulation of lime-sludge in either tank, the sludge is pumped out by means of the change pumps, as shown. The lime-sludge can either be dried and used for luting purposes or can be thrown on to the waste heap. The spent liquor after leaving these tanks, is of a light straw colour, but clear, and can in most instances be discharged directly into the sewer without causing any nuisance whatever. But under exceptional circumstances, it will be necessary to treat the liquor with a view of removing the cyanides, which can be done by any of the processes which have been patented, and which have been used in several works in this country.



Sulphate of Ammonia Plant.

The treatment of the "devil liquor" from the condensers and heater is always a question that requires consideration; and this plant is so arranged that the liquor can go back into the store tank which contains the gas liquor required to be pumped into the plant, or it may be stored in separate store tanks for treatment through the plant when not being worked for the recovery of the sulphur. Either process the plant is well adapted to perform; but it is strongly recommended that storage should be provided for the devil liquor of sufficient capacity for a week's make, and then this may be worked through the plant. The whole of the sulphuretted hydrogen evolved therefrom in working passes into the Claus plant, where the sulphur is recovered in the manner previously described.

It will be observed that the operations are comparatively simple. The still need no longer be looked upon as a column of complicated conundrums, which it appears to be the purpose of some interested individuals to make it out to be. The chemical reactions which take place in the saturator are very simple ones, and easy to understand; and the true value of an acid saturator is not rightly judged by the number of tons of lead disposed of in its construction. The whole process is such a one as a gas-works manager should take pleasure in learning to understand himself, so that he could instruct one of his intelligent workmen to continue to carry out. It will become more and more imperative that every gas-works near agricultural land should do this; and the doing of it well will bring benefit to the gas concerns and to the country generally.

It will be evident from the foregoing description that sulphate works are now possible in towns and places where not previously permissible, owing to processes for purifying the effluent liquor having been recently perfected.

The author might here describe the various forms of apparatus that have been in use at the St. Helens works. The first form of still he became acquainted with was a huge cast-iron intermittent still, the property of a distiller who took the Company's liquor and worked it up on his own works (within the gas-works); and it was worked very skilfully and made to pay the owners well. Sulphate of ammonia was in those days sold packed in large sugar tierces, and fetched upwards of £20 per ton.

The next apparatus in advance of this was also by means of intermittent stills made of wrought iron; and in this apparatus experiments were first made to use pyrites acid in the manufacture of white sulphate of ammonia. To secure this end, the saturator was not worked so as to "salt down;" but its contents were kept in the condition of "mother liquor," which, being run from the saturator to a receiving tank, was allowed to settle—the clear liquor being run from between the mud settled at the bottom and the scum which remained at the top. This liquor was afterwards transferred to a "salting-down pan" of the form shown, and from which the salt was fished as it fell, upon evaporation being carried to a sufficient point by means of a steam coil. The mud and scum were collected in other vessels and washed; the liquor from these washings going afterwards to the saturator to keep its contents at the requisite strength.

The next advance on this (which was a great one) was the adoption of continuous stills. The experience of the author suggests, in all installations of this kind of plant, the necessity for overhead tanks of sufficient capacity to give a continuous feed of

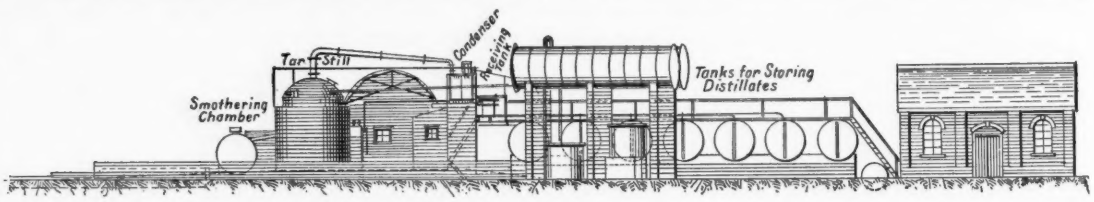
liquor without agitating the tar which settles at the bottom of the tank, or the light tar scum which floats on the top of its contents; that the still should have a roomy top chamber or head, in which the foaming of the incoming liquor can take place without causing any priming of the still, as the author believes occasional priming of stills is one of the sources of that mysterious discoloration of the product which interferes so much with the production of salt of good colour whenever it occurs. The still should be so constructed as to have the several trays easily get-at-able, and so that the hoods are not readily interfered with by any deposition of scale, &c., which may form within the still. The liming-chamber should be roomy, and its arrangements provide for intimate admixture of the liquors contained therein, and the secondary still of ample capacity for efficiently treating the liquor flowing through it. An intermediate vessel should also be provided for the removal from the flowing liquor of the lime-grit which in some forms of stills readily deposits, and interferes with the working of the secondary still if not removed.

The saturator is a very important piece of apparatus in this process; and the author has found the shape of those shown to be most efficient for such a process as is worked at St. Helens, where, for the purpose of using the pyrites acid, the impurities of the acid have to be removed from combination in the saturator. With these important points attended to, the drainage and storage and loading-up may be easily arranged according to circumstances. But, in considering this plant, one should not neglect the milk-of-lime preparing apparatus, which should be of ample size, and so constructed as to give to the still a regular supply of known quantity. The treating of the waste gases and effluent liquor depend upon the local circumstances. A sample of the sulphate made from pyrites acid used is on the table. The St. Helens product holds a good place in the market, and can always be sold at the best market price.

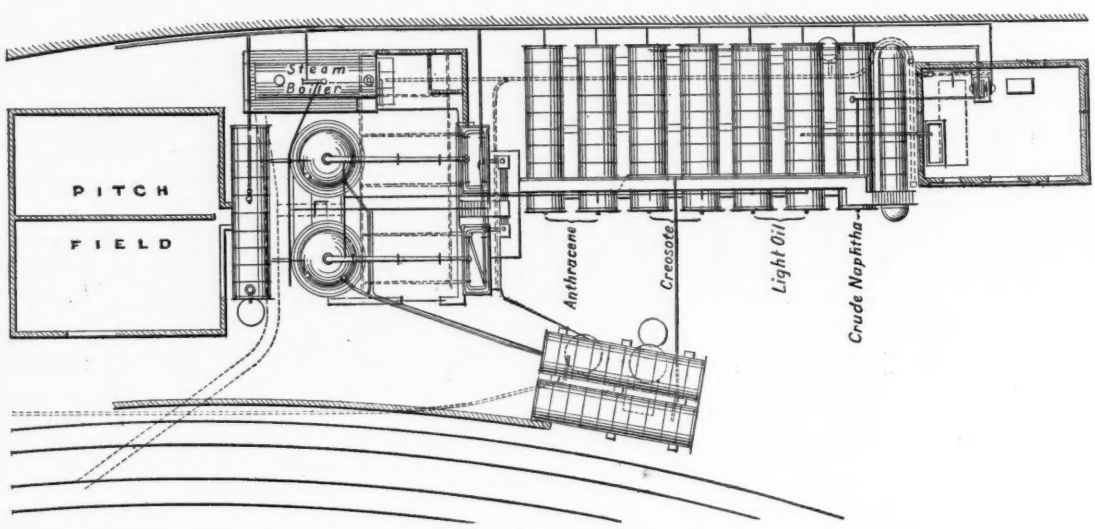
Tar.—Gas-works tar, as is well known, is usually sold at so much per weighed ton; the price in some cases being ruled by a sliding-scale which works more or less successfully, as judged from various standpoints, and dependent upon the point of view. In some few gas-works tar-distilling plant has been erected for dealing in a simple way with the work of distilling the tar produced in the works; local needs or circumstances having very often led up to this being done.

The author's experience with tar-distilling plant at St. Helens extends throughout the last decade, at the beginning of which the operations for carbonizing the local slacks for the production of gas had been so nearly perfected—as they can be with horizontal retorts—that the tar was considered to be something at which the before-time tar contractors could turn up their noses; and as it never seemed to enter our heads to alter our carbonizing operations for the purpose of making tar to suit the ideas of tar distillers, we put down a simple plant wherewith to deal with our own tar, and found that such a plant adds another string to the many-stringed bow of the "up-to-date" gas-works manager.

The apparatus consists of two stills erected side by side; each still capable of containing, when charged up to the working level,



ELEVATION.



PLAN.

St. Helens Corporation Tar Distillery.—1893.

13 tons of tar, which is received into them from an overhead storage tank containing a steam-coil, which keeps the tar in the best condition for entering the stills. The condenser consists of a nest of ordinary flanged cast-iron pipes connected by means of suitable bends. The collecting boxes are provided with the necessary taps for controlling the flow of the distillates to the several storage tanks, which are placed in a range and labelled with the name of their contents. The pitch-cooler is on the opposite side of the stills, following after which are the necessary pitch bays and storage yard, alongside which a railway siding runs, upon which the waggons are placed while being loaded. The storage yard can be easily approached by carts for local sales. The stills are fired very gradually the first day; the fires being banked up during the night, and the working off of the still completed during the next day. The pitch is run into the cooler immediately after the work of distillation is finished, and into the bays when sufficiently cooled.

By means of this plant, the following products are obtained: Crude naphtha, which is afterwards transferred to the gas-enriching department, being used in a scrubber in which gas, on passing through, is allowed to exercise a selective influence, and takes up the lighter enriching products, leaving with the heavier portion much of the naphthalene with which it had up to that time been associated. This portion goes back to the tar-well after having done its work in the scrubber.

The ammoniacal liquor which comes over with the crude naphtha upon first heating up the still, is returned to the sulphate of ammonia department. The light oil is the next distillate; being stored until it is sold to manufacturers of carbolic acid, &c. The creosote oil, which is the third distillate, is sold as liquid when separated from its associated naphthalene (called creosote salts); and the close relationship of this distillate and the naphthalene of the crude gas from which both come, may be observed from the samples of creosote taken during a distillation at every quarter of an hour of the time during which this distillate was coming over. When the liquid is separated from the salts, the latter may be used for the manufacture of various other compounds, or sold as drained salts. There has, however, recently sprung up quite a new (and yet very proper) demand for the oil associated with the salts—for the treatment of timber; it having been realized that the liquid which English engineers have always specified for, is, after all, better when used associated with the salts.

The next distillate is anthracene, for which the market is not good at present. The oil from it, however, is valuable for several purposes; and the paste from it is used up in the production of medium soft pitch, which is the best quality for most purposes, and from which the best asphalte tar can be prepared by the proper admixture of some of the anthracene.

Prepared tar for all purposes for which tar is usually bought —for timber and iron preserving—can best be made in a tar

distilling works; and the author considers raw tar should not be sold either for these purposes or for the treating of road surfaces, for which tar of the proper consistency is being properly used in many parts of the country now its true value for this purpose has been proved. At one works, it is within the author's knowledge, there is machinery which has been working for some time in the preparation of tar macadam suitable for road making.

Other Bye-Products.—Other bye-products occupying the attention of gas engineers in various works may be mentioned—such as the production of sulphuric acid from the spent oxide used in purifying the gas produced; and of this our President has shown us an interesting and successful example at those splendid new works which we had the pleasure of visiting a short time ago. With most coals, it will be found that, with a properly worked plant, more than sufficient sulphuric acid can be produced for use in the manufacture of the sulphate of ammonia obtainable from the same coals.

In some works where the spent oxide is not so used, it is employed for the production of sulphur by means of a Claus kiln; and samples of sulphur so produced are on the table.

Where lime is used for purification, this is now-a-days usually ground and sold to the farmers; but in one or two works in the country machinery is already at work for the utilization of waste gas lime in combination with furnace clinker, which was formerly admitted to be one of the things that no use could be made of. This process has, however, now been so nearly perfected that very valuable bricks and tiles can be produced from these so-called waste materials. Samples of the products of this process are on the table for your inspection to-day; also samples of one form of briquettes made from coal dust and coal-tar pitch, and, what is newer still, the product of a machine (which the author saw being made in this country to be sent out to Canada) for the production of briquettes containing 60 per cent. of coke breeze, 30 per cent. of coal dust, and 10 per cent. of pitch.

Retort carbon is produced in such small quantities in modern gas-works that, although it is now fetching a better price, it does not bulk very largely in the bye-products account.

One of the bye-products of gas-works which has risen in importance within recent times is cyanogen. This gas, instead of being allowed to deposit itself upon the purifying material, so far as it would either in the coal-gas purifiers or at the sulphate works, is now being recovered as a valuable compound, such as ferrocyanide of potassium or soda, in such a process as the President mentioned in his address—samples of which, prepared by the apparatus so described, are here for your inspection to-day. At the author's works, there not being room for a complete plant for the production of this salt, a process has been adopted (and is now just being installed) for the production in a special scrubber of a liquor containing ammoniated sulphocyanide, which will be sold after treatment for the recovery of its ammonia in a special still which will be intermittent in its operation owing to the special care necessary to distil this liquor and the large amount of lime required to be used during the distillation for its proper decomposition. The remaining liquor is sold as calcium sulphocyanide, to be used for the production of one of the cyanogen compounds so much used in gold extraction and for other purposes.

By some of these several means gas managers are, all over the country, reducing their net manufacturing costs; and so far as the author has been able to carry them out, they have enabled him to make the best use of his local conditions and local supplies of raw materials, so that during upwards of the last ten years the coal and oil bills have been more than paid for by the net cash received from bye-products, and the net cost of 18-candle gas (which is purified free from all carbonic acid, and with the sulphur compounds reduced to, on an average, under 10 grains) put into the holder during the last few years has been, including all manufacturing and maintenance and locomotive charges, less than 5d. per 1000 cubic feet.

[The paper was illustrated by drawings, lantern slides, and a large display of bottled and solid products.]

Discussion.

The PRESIDENT said he was sure the members were all very much obliged to Mr. Glover for the paper he had given them. Having looked through the transactions, and not finding any papers distinctly bearing upon tar-distilling plant, he (the President) had asked Mr. Glover to give them a paper upon it. It was not a subject that came before many gas managers in daily experience, because there were comparatively few in the country who had tar-distilling plant. He had therefore asked Mr. Glover if he would give them a paper about his plant. But he had enlarged upon that, and had practically dealt with residual products altogether from gas-works. And no doubt wisely so, because he had given the members a great deal of useful information which he thought they would carry away, and make good use of. The paper opened up a large field for discussion—larger than a paper would have done dealing only with tar-products plant. He (the President) well remembered his first visit to the St. Helens Gas-Works in the time of Mr. Glover's predecessor. He believed it was in 1881. He was then about to put up a sulphate plant; and he had heard that at St. Helens they were doing extremely well. On that occasion, he saw the old-fashioned plant that Mr. Glover had shown them. He (the President) put up an intermittent plant at that time, but not exactly on the St. Helens lines. But the character of the plant notwithstanding—the price of sulphate was high just then—the yield of sulphate was very high at St. Helens—being something over 30 lbs. per ton of coal carbonized. Therefore, with the old-fashioned plant they were doing extremely well. He (the President) was sure there would be a good discussion. Though few of the members had had personal experience of tar distilling, a great many of them had had experience of other processes of working up residuals.

Mr. J. H. BROWN (Nottingham) thanked Mr. Glover for the very instructive and lucid paper he had given the members. Although he (Mr. Brown) had come quite unprepared to make remarks upon such an extensive paper, the subject was one in connection with which he had perhaps had as much practical experience as most of the members; and, with that experience, he could not fail to be struck with the thoroughness with which Mr. Glover had dealt with the subject. One of the author's drawings that had been staring him in the face the whole afternoon was of the Claus recovery plant. In many works this plant had not been the success that it ought to have been, on account of the construction of the chambers for the deposition of the sulphur. Mr. Glover had taken the wise precaution of strongly bracing the first two chambers. In his own case, the chambers had cost them a considerable amount in reconstruction, simply owing to their not having been properly erected at the outset. They found that the sulphur interacted with the mortar used; bricks were lifted from their proper position; and the arches were continually breaking away. As he had said, this had cost a considerable amount for repairs and maintenance. The type of still that Mr. Glover employed for the sulphate of ammonia plant was much smaller than that in regular use throughout the country; but apparently it gave excellent results. They were making at Nottingham sulphate of ammonia from acid prepared from spent oxide, which contained practically no cyanogen; but they could not obtain such beautiful white sulphate as Mr. Glover had shown them. Mr. Glover's remarks regarding briquette making were of particular interest to those who had large works and were carbonizing at the same time Derbyshire coals. Carbonizing Derbyshire coal, and using stoking machinery and coke-conveyors, a large proportion of breeze was produced per ton of coal. He could mention individual coals that he had found produce 60 to 70 per cent. of breeze per ton of coal. He was left an inheritance of 20,000 tons of coke breeze or dust; and to dispose of this was one the biggest troubles they had had at Nottingham. If they could deal with such stuff in the manner mentioned by Mr. Glover—using 60 per cent. breeze, 10 per cent. pitch, and 30 per cent. coal dust—and produce a saleable briquette, it would be a godsend to them. There were many other points he should like to discuss; but, in the multitude of the points, he was afraid, he was not prepared to give expression to his views upon them all that day.

Mr. T. BERRIDGE (Leamington) observed that Mr. Glover had said it would not do to use crude tar for preventing dust on roads. In Warwick and Leamington, most of the authorities had been using crude tar, put on cold, with sand scattered over it. It had been a complete success; had stopped all dust; and had saved more than its cost by the additional resistance to wear it had given to the roads.

Mr. J. FERGUSON BELL (Derby) said he should like to associate himself with the last two speakers in thanking Mr. Glover for his able and most comprehensive paper. The first question that he touched upon was that of coke. He (Mr. Bell) remembered that a number of years ago the relative amounts they obtained were one-third for coke, one-third for tar, and one-third for sulphate of ammonia. But now, if they took £100 of residual products, the proportion was 50 per cent. for coke, 25 per cent. for tar, and 25 per cent. for sulphate. Coke was, therefore, now their most important residual product; and he thought they could do a great deal more than they had done in bringing before their consumers this valuable smokeless fuel. It was most valuable, but it was often sold at much less than it should be, because householders did not know the value of it for fuel. Mr. Brown had spoken of Derbyshire coal. There was Derbyshire coal *and* Derbyshire coal. He (Mr. Bell) carbonized practically all Derbyshire coal; and he had little breeze. In fact, he had to break his coke. A little while ago, they put up a screening arrangement, and had had no difficulty in selling the small quantity of breeze that was made. The manufacture of sulphate of ammonia was a very simple matter; but at a large number of gas-works, the most difficult question to deal with was, of course, the spent liquor from the stills. Unfortunately, there were a few borough engineers who objected to the spent liquor, because they said it interfered with their bacteria beds at the sewage works, and so would not allow it to go into the sewers. Gas engineers had therefore to find other means of dealing with the liquor. He had heard with pleasure from Mr. Glover that there was a process by which they could treat the effluent liquor, because, in their own case, it was very difficult to dispose of. The model sulphate plant that Mr. Glover had brought before them was an excellent one. It was somewhat similar to one they had in use at Derby. He (Mr. Bell) could recommend the arrangement of sulphate discharge from an overhead saturator. Some six years ago, the saturator in use was emptied by fishing or ejected by means of steam. They found this a constant source of difficulty. A smaller saturator of the overhead type was then put in; and it had been in use some four years. It had not cost a penny, and was practically as good now as when they erected it. The salt was discharged and came out very hot; and after being in the sulphate

stores for three or four days, it was practically dry and ready for sale. With reference to dealing with the gases from the still, they had at present two oxide boxes. He believed he was one of the first among gas engineers to put up a Claus kiln at Stafford many years ago. There were great difficulties with it; and, as had been pointed out by Mr. Brown, the first three or four of the chambers were constantly getting cracked through the action of the gases on the mortar, and heat and cold. The author had wisely divided the kiln shown in the diagram into two chambers, and braced them together, so as to keep them from cracking and expanding with the heat. It was certainly a very much more scientific and perhaps better way of dealing with these gases; but as far as the £ *s. d.* was concerned, he questioned its utility. He found he had some difficulty in selling the sulphur which got slightly tinged with tarry matters, and it contained a good deal of water; and therefore they had to sell it at lower prices. They had two large oxide purifiers; and the gas was passed through one box, and then it was shut off and air blown through. Alternately the gases from the saturator were reversed; and by this means they could carry on a box for several months without any expense. The important question was that of tar; and they must all regret very much, seeing that tar was a residual that contained so many valuable products, that they were only getting somewhere about fuel value for it. Sir George Livesey had pointed out, in a very able manner in the "JOURNAL" as recently as Oct. 16, that if a better price could be obtained for tar to the extent of 1d. per gallon this meant 1d. per 1000 cubic feet off the price of gas. Therefore it behoved gas engineers to make the best they could of their tar; and they could make the best out of it only by finding new markets. The German distillers bought the tar products at any price they liked; and they got sufficient of the products to keep them going four or five years in advance. Anthracene many years ago was worth 4s. per unit; now it was sold at about 1½d. per unit. No wonder Mr. Glover appeared to have given up making it. He was surprised to hear Mr. Glover say that tar to be used for road-making must be distilled. At Derby, he was selling a large quantity to the Corporation; and it was not distilled. It was kept clear of water; and he had never had any complaints. The tar was used for a variety of purposes; and he should be sorry if they had to put up any kind of still to deal with the tar before it could be used for the making of roads. There was no doubt that the use of tar in the construction of roads was most valuable. It made a dustless road, and, more than that, it provided a coating over the road that was practically impervious to water. It was the water that got into the road, and which disintegrated it in winter, that caused such mischief. Gas undertakings ought, in his opinion, to sell their tar as cheaply as possible to local corporations for road-making. In Derby and Derbyshire generally, most of the footpaths were laid with asphalte; and he did not think there were any nicer footpaths than those made in that way. It was another direction in which they might encourage the use of tar. As a Company, they did a little of this work at Derby.

Mr. GEORGE HELPS (Nuneaton) said, in these days of keen competition, anything that tended to show gas engineers how to reduce the cost of manufacture was of the utmost importance. There were not many men present who were not interested in the commercial aspect of the paper. Of course, Mr. Glover had had to deal with a very huge subject; and he could not very well go deeply into the commercial aspect of the various products of which he had treated. There were, however, several of the members who had charge of more or less small works who could not follow the paper without they were induced to do so by some very special gain in the reduction of costs on the whole. Mr. Glover had given them his figure of net cost as something less than 5d. He should like to ask Mr. Glover to give, if possible, his costs for coal, wages, salaries, and maintenance of works, and then, in addition to that, the net profit on his residuals, so that the members might get at what the 5d. meant.

Mr. GLOVER: May I be allowed to say it is the net cost, after taking into consideration all that is mentioned by Mr. Helps.

Mr. HELPS said he hoped that was clear; but it was very difficult for anybody to follow the issue of a figure like that. He, however, ventured to submit that the figure was very vague—at any rate, it was to him; and if Mr. Glover would give them the figures he had asked for, it would be a very great help.

Mr. H. E. COPP (West Bromwich) remarked that Mr. Glover had emphasized the necessity of making coke more marketable. He imagined the author meant by breaking, and sorting up into sizes for the local industries. That, of course, entailed a considerable amount of fine dust. Mr. Brown had mentioned his accumulation of breeze. What they generally understood by breeze was, he supposed, the dust and small mixed.

Mr. BROWN: The dust alone.

Mr. COPP said if dust alone was the resultant product of sizing the coke, that was a very valuable fuel, if it could be utilized. Mr. Glover had mentioned the making of briquettes. Of course, that suggested a fairly expensive plant, which was beyond the means of most gas-works of small, and even medium, size. He found that fine coke dust of ordinary quality had a high evaporative power when used in a boiler; but the difficulty was the using of it. If they had not forced draught, it would not burn at all; and if they had forced draught, they blew it over, and stopped the flues. If some members present could throw light on this subject, the other members would be very grateful—that was to say, throw light on some means of preventing this blowing over of dust into the flues, and so enabling them to still better utilize this very valuable fuel. He had had from it as high an evaporative power as 7 lbs. of water per pound of fuel, which was an extremely good result. Another point which occurred to him as Mr. Glover was reading his paper, was the question of distilling the tar—whether he found any difficulty due to the presence of water in the tar. He (Mr. Copp) believed that it was perfectly true that, owing to better conditions of carbonization nowadays, the tar had less light oils remaining in it, and was consequently more viscous; and, when distilling, the water made it froth, and it was difficult to keep it in the stills—that was to say, it boiled over. He should also like to know whether anyone could give information as to the best means of removing the water from viscous tar without mechanical power. It could, of course, be done by means of separators; but that would be beyond the pockets of the ordinary gas undertaking.

Mr. W. LANGFORD (Longton) said with reference to tar for road-making, he had for some years used it for this purpose, even in the gas-works yard. In the past summer, he put up a tar-boiler, and had given the whole of the roadways about the works a coating of tar, putting over it a thin layer of sand and fine gravel. He had got as a result a much nicer road for traffic. It was perfectly noiseless, and free from dust. He might say that this was a permanent cure for the dust nuisance. Then, as to Mr. Glover's remarks with regard to sulphate of ammonia plants, he thought that some of the author's ideas were splendid. He quite agreed with the abolition of the usual purifiers for the exit gases from the still. When he went to Longton, the first thing he was called upon to do by the Government Inspector was to remodel the sulphate of ammonia works; and he condemned the purifiers. The system of purification he (Mr. Langford) then adopted was that of having an open hearth, with 4-inch pipes running underneath, conveying the exit gases to a cast-iron mouthpiece covered over with a plate and perforated. The cast-iron mouthpiece was kept just a little above the surface of the hearth, so that the exit gases could go underneath, as well as through, the perforations. The effect of it was that when a conical heap of oxide was thrown over the casting the gas was absorbed equally at the base and the apex, so that it was not going more through one part than the other. The result was, when sulphuretted hydrogen began to come through the oxide, the sulphate attendant threw on new layers. There was no emptying of purifiers with this system, no danger, and no expense, for the sulphate attendant did all the work. When one heap got unwieldy, another one was set to work; and the other was revivified *in situ*. The Government Inspector had spoken very favourably of the system. It was highly desirable that the exit gases should be cooled by passing through a nest of condensers before getting to the oxide heap.

The PRESIDENT said he was sure Mr. Glover would be well satisfied with the discussion that had taken place. It had been an interesting one to him (the President). He thought that what all the members wanted to bear in mind was the influence of local conditions. Local conditions did make such an enormous difference. What was good for one place, might be bad for another. They could not lay down any universal rule. What would bring in a good return in one place, might bring in a loss in another. It was no use for a gas engineer, finding a good return was obtained in one place, to go straight away home and say, "This will do for me." It might not do; and every particular of the local conditions had to be considered. Mr. Brown, for instance, had mentioned an enormous accumulation of breeze. Notwithstanding, Mr. Brown might be doing extremely well with his coke. No gas concern in the Midlands, so far as he (the President) knew, did better with their coke than the Sheffield Company. Yet he remembered that there they carted away from one works 10,000 tons of breeze every half year—exactly the same as any other grade of coke would be. It was fine dust got mostly from breaking coke. This would show at once that though it paid Sheffield well to break their coke, size it, and get all this breeze, it would not do for every one else to go and say, "Because you are making 4s. 6d. or 5s. per ton in this way, we can do the same." They might not, because there might not be the business. Every concern had its local conditions; and they had to be considered. The same was very much the case with sulphate of ammonia plant. Where a works was in a position to sell the ammoniacal liquor extremely well, it might be better not to put up a sulphate plant. The same applied still more forcibly to the tar-works. For many years past at Coventry, as well as elsewhere, he had considered the question of tar-works; but each time, after he had come to consider it, and had gone into details, he could not absolutely see where he could make enough extra money to warrant the additional anxiety and trouble of the plant. After that he went to St. Helens; he had, in fact, been there on two occasions to see the tar plant. Mr. Glover had told him the origination of his plant was simply due to the fact that he was not getting half the price for his tar that was being obtained elsewhere. But, by putting up the tar plant, he practically doubled his return. That was where local conditions came in, and warranted Mr. Glover in installing the plant. He (the President) did not think it would warrant them in the Midlands, where they were fairly close to tar-works. However, it would be useful to have on record this account of a tar-works of moderate size, should any of the members come to the time when they would have to do something in

the way of putting up such works. They were, therefore, greatly obliged to Mr. Glover for his paper.

Mr. GLOVER, in reply, said he was, as the President had kindly suggested, quite satisfied with the discussion, which had been taken part in by several members. If at any time a question arose when his experience in these directions would be of service, any member would be welcome to visit St. Helens. Dealing more particularly with the discussion, he should like to explain that in the days when the President first visited St. Helens, they were making upwards of 30 lbs. of sulphate per ton of coal carbonized; but they were then carbonizing a local coal which was extremely rich in nitrogenous compounds. In this connection, he might reiterate the President's warning about local circumstances being taken into account. Whenever his advice had been sought on any professional matter, he had always given due consideration to local circumstances, and advised accordingly. Mr. Brown had mentioned the Claus kiln, the construction of which had been considerably improved lately. This kiln had been very largely used in the recovery of sulphur from alkali waste. He remembered when he visited Mr. Bell, now many years ago, at Stafford, he saw the Claus kiln at work there; but since then the working of the system had been very largely improved, and hence its considerable application to the recovery of sulphur from alkali waste. Mr. Brown's remarks had thrown a little light upon the value of an engineer obtaining experience from other works besides those to which he was tied. As to the question of white sulphate from pyrites acid, it was an admitted fact. It was too big a question to explain on this occasion; but he would be pleased to discuss it with Mr. Brown. The subject of briquettes he did not believe would be of any considerable importance to members of the Midland Association; but he thought the information he had given would be valuable to place on record for the sake of any of the juniors who might be called upon to go abroad. The machinery he saw being constructed at Leeds the previous week, was going out of the country to a company having large operations in several towns. This was the first machine of the kind that had been especially considered, because to make a compact briquette from coke dust had hitherto been rather a difficult job. This firm, however, had managed it. The briquette the machine made was of rather a peculiar shape. It was round in the body, with cone-shaped ends. It imitated, as nearly as possible, the shape, size, and quality for use, of anthracite coal. He was pleased to find the reference to this plant had been useful, because the President had mentioned occasions where breeze had been found almost unusable and unsaleable. He had enjoyed very much Mr. Copp's remarks, because he (Mr. Glover) had had experience of the very things of which he had spoken. They were all makers and users of carbon, and if they could utilize its full value they would be doing good; and so the making of briquettes might, in this connection, be very useful to gas-works in the future. Mr. Berridge had crossed swords with him (Mr. Glover) in not a very serious way. Mr. Berridge said he did not agree with certain of the remarks in the paper; but he thought Mr. Berridge had partially misunderstood him. What he said was that *all* tar was not suitable for use raw. This he now emphasized. It was quite possible, in some works where the carbonizing was done successfully (as it was at Leamington), the tar might not contain much that disqualified it for use raw. But as makers of coal gas, and incidentally of tar, they should not leave anything in the tar that would be better in the gas. With reference to Mr. Bell's remarks as to the purification of the effluent from sulphate works, he believed the process alluded to was now so perfect that the purified effluent was allowed to run into streams where there were fish, or into the sewers where the contents went to bacteria beds.

The PRESIDENT remarked that he did not think the purified effluent was allowed to run into streams. They had adopted the process at Coventry, and were told that the effluent must not be passed into streams.

Mr. GLOVER said he had been under a different impression. With regard to the Claus kiln and the recovery of sulphur, he had recently come across a piece of experience which might interest the members, and at the same time answer Mr. Bell's question with regard to impure sulphur from the Claus kiln. When he (Mr. Glover) was thinking of adopting the British Cyanide Company's process, in which sulphur was largely used, he was anxious to find out whether he could again use local circumstances to his advantage. He made inquiry for impure sulphur of the United Alkali Company, and was informed that they did not make any; that was to say, they did not make any for sale. This they were not likely to do, because it could be purified by simply being melted, and the impurities allowed to be deposited from the sulphur. The Claus kiln could only be adopted successfully on a certain scale of largeness. Mr. Bell had mentioned the comparative prices of anthracene of 4s. per unit formerly, and 1½d. now. Mr. Bell's mind had travelled back to a very remote period in the history of tar distillation, to find the time when anthracene was 4s. a unit. Until quite recently, it was profitable to make it; at present it was not. Regarding the raw tar that Mr. Bell sold to the Derby Corporation, he (Mr. Glover) did not think it was used raw. He wanted to emphasize this—that, upon heating the tar in an open boiler, the road-maker drove from the tar certain of the products that were most valuable to gas-works. Some of this tar contained these compounds in such large proportion that it was too valuable for gas makers to sell it raw. Mr. Helps had mentioned the commercial aspect of the question. He (Mr. Glover) thought he condensed the commercial aspect into a nutshell. He did not know how to put it more clearly, inasmuch as the figure given was the average of several years, and he (Mr. Glover) was able to testify that the St. Helens gas-works were not a scrap-heap.

Mr. HELPS could only say there were a good many managers in the room who had to put gas into their holders at a net cost of 3d. or 3½d. per 1000 cubic feet; and they would like to know how much of this cost was attributable to the products.

Mr. GLOVER said he thought Mr. Helps had mentioned a figure (3d. or 3½d.) which was out of the bounds of practical politics, and which might be questioned.

The PRESIDENT remarked that he did not think the point arose on the subject of the paper.

Mr. HELPS thought the commercial aspect was an important factor in the question.

Mr. GLOVER (proceeding) said that as coal carbonizers they did quite right in diregarding the quality of the tar. It had a certain proportionate value, whatever it was; but they did right in perfecting their carbonizing apparatus with an entire disregard to the effect on the tar. However, for the purpose of selling their product free from water, tar makers might put their raw tar into a huge old boiler which was water-tight and would stand a little pressure; and if there was any waste heat about the place, let it just raise the tar to such a temperature as would cause it to let over the water from that crude form of still. Mr. Langford had mentioned the treatment of the waste gases of sulphate works. He touched upon a point there, in connection with which it was only right that they should recognize the agreeable relationships which existed between gas engineers and His Majesty's Alkali Inspectors. He had often come across them in different parts of the country, from Mr. Forbes Carpenter, the Chief Inspector, downwards. They did their duty well, to the advantage of the nation as a whole. They were not slow to find fault when there was room for it. But they were not merely spies; they tried to advance the interests of the gas industry by giving hints whenever they could be imparted. He again thanked the members for the attention they had given to the paper.

Mr. THOMAS BERRIDGE (Leamington) next read the following paper, on

THE CLOCK SYNCHRONIZING APPARATUS AT THE LEAMINGTON PRIORS GAS-WORKS.

You will probably recollect that in May last, your Investigation Committee paid a visit to the Leamington Gas-Works, and, at the spring meeting held at Coventry the same month, made a report to the members on the apparatus used at the Leamington works for synchronizing many of the clocks in the town. Your President, Mr. Stevenson, informed me that there was a general desire expressed by the members present that a short paper on the apparatus should be read at the autumn meeting.

Some years ago many of us had to submit to gas being taken out and electricity put in, and latterly not a few have had the pleasure of reversing this for lighting purposes. Not many now will regret that, in another way, gas has proved more suitable than electricity.

About two years ago, it occurred to Mr. Chandler and Mr. Bonniksen (two of our local clock and watch manufacturers) that they could probably invent an arrangement for synchronizing clocks by a reduction in the pressure of the current in the Electricity Supply Company's mains. They succeeded in doing this, and had fixed up at Leamington a really efficient apparatus. But when they approached the large towns like London and Birmingham, they found that none of the electric light undertakings would take them on, because when they reduced the pressure in the electric supply mains for the purpose of synchronizing, they occasionally stopped the printing machines, motors, and hotel-lifts which were at work. So the promoters then approached the Gas Company, and asked if it were possible to do what they required by means of the gas-mains.

Before describing the apparatus, I will give you a short account of what is being done, at some other places, in the way of synchronizing clocks; and I cannot do better than quote largely from the report of the Special Sub-Committee of the Glasgow Corporation who have recently visited Brussels, Berlin, Antwerp, Stettin, and other cities, for the purpose of inquiring into the subject. From that report we get a fairly good idea of how "correct" or "standard" time is obtained in the various cities visited.

Sixteen years ago, the Normal Zeit Company, Limited, were intrusted by the Municipality of Berlin with the task of supplying correct time; and they have now over 6000 clocks connected to their systems. Each clock has a separate self-contained movement, capable of working (if necessary) for four or five days without rewinding. The operations of winding and regulating are performed, every four hours, by electrical currents from the central station. In addition, a "reporting back" arrangement is in use, whereby the loss or gain in time or the stoppage of the clocks is automatically recorded at the central station—thus enabling the error to be corrected before inconvenience is caused to the public.

The advantage of clocks being self-contained is that it renders them independent of the line-wire; so that in the event of an

interruption, accidental or otherwise, to the line or central apparatus, the clocks continue to go for four or five days.

The public clocks have special pillars provided, or are placed on the top of "Urania Towers," which usually stand at street crossings. They are about 15 feet high, and the clock faces (of which there are usually two or three) are about 13 feet from the ground. The sides of the tower (which covers a pavement area of about 3½ square feet) are let for public advertisements; and the sum of £600 per annum is said to be derived from this source. Fixed on the towers are also a barometer, thermometer, and hygrometer; a plan of the city, and the addresses of the nearest police, fire, and ambulance stations are exhibited. Each clock dial is 2 feet in diameter, and consists of a single piece of opal glass, protected by a piece of plate-glass. It is also illuminated at night by five incandescent lamps. The clocks are both wound and regulated from the central station; and there are said to be 76 fixed on the pillars and "Urania Towers" in the city and suburbs.

The largest business, however, done by the Company is the hiring out of electrically wound and regulated clocks to private subscribers for use inside and outside dwelling houses, shops, offices, warehouses, factories, &c. There are about 5000 of them in use, showing how all sections of the community participate in the benefit of having correct time.

Again, it cannot be said that the system is expensive, as the Company supply clocks wound and regulated from the central office at a rental (varying with the size) of 2s. to 4s. per month, for indoor clocks, and 5s. to 7s. per month for outdoor clocks. The same remarks do not apply to the turret clocks. These are purchased by subscribers, who have to pay the Company from 6s. to 15s. per month for regulating and keeping them in order—winding being also an extra charge.

This system is capable of being extended in a variety of ways. If, for example, it is thought desirable to indicate the standard time throughout the apartments of an hotel, or any other public or private building, one centrally regulated electro-mechanical movement is arranged to act as the master-clock; and this operates (on a local circuit) as many electrically propelled dials as desired. The working current requisite is derived from accumulators, which are charged once a week from the lighting mains. The cost of charging a battery capable of operating 2500 clocks is covered by a yearly payment of £2 8s., which works out at a power rate of 2d. per unit. The connecting wires from the clocks to the central station are run by underground cables, which are rented from the Imperial Post Office Telephone Department, at a rental of £3 12s. per mile per annum. As many as 64 clocks can be operated upon in one circuit, which are all connected by a single wire.

The entire system is controlled by a master-clock, which is wound daily, and regulated from the observatory. In addition, a "stand-by" master-clock is provided. This is automatically switched into circuit in the event of any interruption taking place in the functions of the master-clock, the duties of which may be numerated as follows: (1) To transmit the currents at the proper intervals for regulating and winding the subsidiary clocks. (2) To operate the "reporting-back" apparatus. By this arrangement, the working condition of every subsidiary clock is indicated on a moving paper strip once during every four hours. This is essential to the proper working of the system, as it enables the attendant at a glance to detect errors or stoppages, and obviates the necessity of having the irregularities reported by the observant public—thus preventing inconvenience to the citizens by the delay which might otherwise be caused.

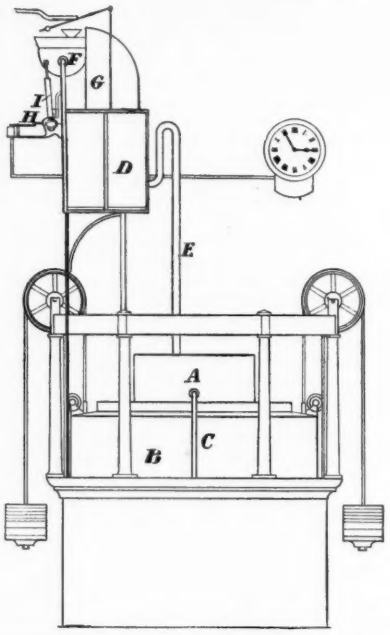
Yet another system is the "Popp" clocks installed at Paris. These clocks are controlled by compressed air; but the system is not satisfactory.

Almost all the other systems may be described as impulse-clocks, to be controlled direct from the central station—the working of the clocks thus depending entirely on the continuity of the circuit as well as the central apparatus.

Having so far endeavoured to give a brief outline of some of the methods employed to obtain "standard time," I will now bring to your notice the system which we have introduced at Leamington. Tested by means of a few trials, it was found that the impulse given by the addition of more pressure at the station governor did not take many seconds before a corresponding increase could be felt in all the mains which were supplied by the governor. So, by taking careful note (by means of standard stop-watches) of the time taken to travel to any particular part of the town, we were able to get the exact time, and the necessary allowance is made for the locality.

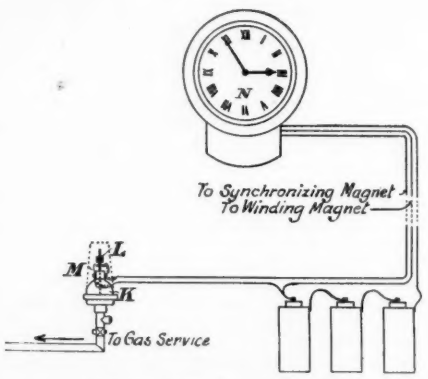
From what I have just said, you will understand that the clocks are synchronized by means of a temporary increase in the pressure in the mains, which makes an electrical contact inside each building where the clocks to be synchronized are fixed. At the time of contact, a battery of dry cells is brought into action and energizes a magnet placed in each clock. This magnet then moves the hands backward or forward, whichever way is necessary to bring them to the exact time. Every day the pressure is automatically increased at the works at 3 a.m., by a current sent from an electrically driven master-clock; the total increase in pressure being 12-10ths. This arrangement is brought about by loading the governor with water; and the following description will enable you to understand how it is done.

A tank A, 3 feet in diameter and 15 inches deep, is fixed on the bell of the governor B; while an outlet pipe, C, is fitted in the bottom. Directly over this is fixed another tank, D, supported on iron brackets fixed on the columns of the governor. This tank is 2 feet in diameter, and 2 ft. 6 in. deep. It is emptied by two copper syphons, E, 2 inches in diameter, and it is also fitted with a hood, G, and into it a small tippling tank, F, empties itself. The tippling tank is supported on pivots at a point slightly below its centre of gravity when it is filled with water. It is so balanced that when it is empty it tends to remain in a vertical position; but when it is filled with water it would fall over towards the large tank, but is prevented from so doing by means of an electrically operated catch, H. Provision is also made to prevent it moving too rapidly. This is done by a pneumatic check, I; also it is provided with a stop, so that it shall not strike the edge of the large tank.



Apparatus to Increase Pressure for Synchronizing Clocks.

Water from the town mains is supplied to the apparatus, passing through a ball-cock fixed over the tippling tank, but having the ball floating in the large tank. The water flowing in first fills the tippling tank, and then overflows and runs into the large tank until it reaches a point just below the top of the syphons. When this point is reached, the ball rises and shuts off the water. Then, when the tippling tank is emptied into the large tank, the extra amount of water is sufficient to start the action of the syphons.



Apparatus at the Consumer's House.

The mechanism employed to make the tippling tank discharge its contents may be described as follows: The electric catch consists of an electro-magnet fixed vertically under a soft-iron armature attached to a lever. At its opposite end is a stud, over which is placed one end of an iron bar pivoted at its centre; the other end of the bar being in contact with the end of a rod attached to the tippling tank. When the current is sent through the electro-magnet, the armature is attracted, thus raising one end of the bar, and in consequence depressing the other. This action releases the rod attached to the tippling tank, and allows the tank to fall over and empty its contents into the large tank. This flow of water is sufficient to start the syphons, which rapidly empty the contents into the large tank on the bell of the governor—causing it to give an increased pressure in the mains. After this, the

water runs away through the outlet pipes until the tank is empty—gradually reducing the pressure until it is again normal.

Turning now to the apparatus to make the contact when the pressure is raised. This consists of a small cast-iron casing, K, containing a diaphragm similar to that of a diaphragm governor. A vertical spindle, L, has attached to it a small block of brass carrying a platinum contact. When the diaphragm is lifted by an increase of pressure, the spindle is raised and the contact touches another contact fixed at the end of a spring, M, attached to, but insulated from, the iron casing. Insulated wires are led from the contacts to the master-clock, N, which controls the remainder of the clocks in the building where the apparatus is fixed.

The mechanism for automatically winding the clock at short intervals consists of an armature which moves in an arc of a circle over the poles of an electro-magnet. As the clock runs down, the armature moves away from the poles; but on reaching a predetermined position, contact is made—thus energizing the magnet and sharply attracting the armature, so as to wind up the clock and break the contact.

In conclusion, I direct your attention to the advantage of synchronizing clocks by gas pressure, which greatly decreases the outlay of capital at the beginning of the undertaking compared with the expense of wiring overhead or underground, which is a necessary outlay on all electrically synchronized clock systems; and also that turret clocks in church towers or public buildings can be synchronized even though they be of old construction and wound by hand. I feel sure that anyone going into the matter of synchronizing clocks cannot fail to see the advantage of introducing gas pressure in preference to electricity.

Discussion.

Mr. BERRIDGE, at the close of the paper, stated that the Syndicate in Leamington paid the Gas Company a certain sum for every clock connected to the synchronizing system. They also put in all the apparatus; and the Gas Company had not had to spend a single penny. All they had to do was to let the Clock Company put on the pressure for the short period of 1½ to 2 minutes in the middle of the night. It seemed to him like getting something for nothing. If in a city like Berlin, they could get 6000 clocks connected, in cities like Birmingham and other large places, there ought to be no difficulty in likewise getting a considerable number of clocks connected. The object of synchronizing the clocks at 3 o'clock in the morning was that they were then working at low pressure; and they could then hardly perceive any difference in the bye-pass jets of incandescent burners. The system had been at work at Leamington now something like eight to ten months; and the apparatus at the gas-works, he might say, had not once failed. It worked perfectly, as did the apparatus at his house. Perhaps Mr. Chandler would describe how the clock worked.

Mr. F. A. CHANDLER, of Leamington (joint inventor of the clock with Mr. Bonniksen, of Coventry) described both the clock and its action by a sample one that he had with him. He also replied to several questions. His remarks can be generally summed up as follows: Briefly described, the clock is synchronized by a falling lever. This lever is mechanically wound up slowly into position during the 24 hours. Two minutes before the time fixed for synchronization, one of two gaps in the electric circuit is closed in the clock itself. At the precise moment arranged for operating at the gas-works, the second gap in the circuit is closed by the small governor described in Mr. Berridge's paper. The electric circuit now being complete, the electro-magnet in the clock is energized. The responsibility of starting the lever is transferred from the mechanical device (which is raised to its highest position) to the electro-magnet. In getting hold of the electro-magnet the circuit is again automatically broken. The mechanical device having released the lever, it is held only momentarily by the electro-magnet, as the circuit is no sooner completed than it is broken. The lever now falls, and, in falling, brings the hands of the clock to time. It is arranged to operate in a total of four minutes—two minutes either way. As it is essential that the two gaps in the electric circuit should be closed simultaneously before the magnet in the clock can be energized, and as the circuit in the clock can only be closed once in 24 hours, it follows that the gas pressure can be varied as frequently as desired during the remainder of the 24 hours without in any way affecting the clock.

The PRESIDENT said it seemed to him the paper and explanation combined made the subject complete without discussion. Some time ago, as those present were aware, the members of the Committee went to Leamington, and saw one of these clocks actually at work in Mr. Berridge's house; and it was so arranged on the occasion that synchronization took place at a time convenient to the Committee—about five o'clock in the afternoon. Mr. Berridge told him the arrangement had been installed in his house some time; and it certainly worked splendidly. From the mechanical and electrical point of view, they must admire the arrangement and the invention as a practical apparatus. The question was, Would it be of any real benefit to the gas industry? The first thing was for a company to be successfully formed. The company wanted capital; and after this was done, they would as gas engineers get the benefit, because he understood there was a certain payment to the gas company for each clock that was connected. So that just for the use of a temporary increase of pressure at 3 o'clock in the morning, and no expenditure on their own part, there was a small receipt for every clock. If the clocks connected ran to thousands in cities such as Birmingham, it would mean a fair amount of revenue. It struck him that even in such gas-works as were being built at Foleshill by his own Corporation, they might have their own clocks synchronized from the governor. The governor at Leamington, if he remembered rightly, was in the meter-house. It was a high building; and this apparatus required a great height. He did not know what the overall height of the apparatus was; but certainly it struck him as being about 20 feet.

Mr. BERRIDGE: About 15 feet.

The PRESIDENT said that at Coventry, they would have to take off the roof and raise the walls before the arrangement went in. If the height could be lessened, it would enable many gas-works to readily instal the apparatus.

VOTES OF THANKS.

Mr. R. O. PATERSON (Cheltenham) said he had been very much tempted to get on his feet, and have a good long discussion on Mr. Glover's paper. There were in it many points one would like to have talked about; and personally he would have preferred seeing the discussion postponed to another meeting, for they could well have done with a second debate on the paper. He had much pleasure in proposing a vote of thanks to Mr. Glover and Mr. Berridge, and he should like to include Mr. Chandler. He thought the clock that the last-named gentleman had described to them was one of the prettiest instances of the adaptation of that almost unique force called electricity that he had seen for a long time. The clock was a wonderful specimen of ingenuity and simple adaptation of means to an end.

Mr. J. FERGUSON BELL seconded the motion, which was unanimously carried.

Mr. GLOVER, in reply, said he was glad to find his contribution to the transactions of the Association had been acceptable to the members, and had been spoken of as being helpful. In presenting the paper, he was only returning the compliments he had himself received from members of the gas profession, and that was the most encouraging help in any difficult problem. In his experience, it was one of the special features of the profession that its members were always ready to lend a helping hand; and the same might be said of the Technical Press.

Mr. BERRIDGE and Mr. CHANDLER also briefly replied.

NEW OFFICERS.

The PRESIDENT said with regard to the election of officers (under the new rules) for the ensuing year, as no other nominations had been received, he had to announce that the following gentlemen were elected:—

President: Mr. JAMES H. BROWN, of Nottingham.
Vice-President: Mr. HUBERT POOLEY, of Stafford.
Hon. Treasurer: Alderman W. R. COOPER, J.P., of Banbury.
Hon. Secretary: Mr. C. MEIKLEJOHN, of Rugby.
Committee: Mr. EDWARD ALLEN, of Liverpool; Mr. G. E. STEVENSON, of Long Eaton.
Auditors: Mr. FRED LEE, of Hinckley; Mr. A. T. HARRIS, of Market Harborough.

Mr. BROWN thanked the members for the honour they had conferred upon him. He should do his utmost to make the meetings and the Association a real success during his term of office.

Mr. POOLEY also thanked the members for the great honour they had done him. He should certainly endeavour to promote the complete interests of the Association; and he trusted, if the time came for him to occupy the higher office, that he should in it be able to assist in the same direction.

Mr. COOPER, Mr. MEIKLEJOHN, and Mr. STEVENSON acknowledged the confidence of the members.

This concluded the business proceedings; and shortly afterwards the members dined together—among the guests being Mr. S. E. Stevenson, of York, and Mr. Chandler, of Leamington.

International Competitions of the Societe Technique du Gaz.

By a circular from M. Coze, this year's President of the Société Technique de l'Industrie du Gaz en France, we are reminded of the competitions that are open to all the world, and of the valuable prizes that are offered by the French Gas Society. Full particulars of these competitions can be obtained from the Secretary of the Society, at No. 105, Rue Saint-Lazare, Paris; but it may be well just to enumerate the different classes. In the first division, prizes will be awarded to persons who have made marked progress in any one of the six following classes: (1) Apparatus for the manufacture or utilization of gas; (2) incandescent gas-burners, working under normal conditions; (3) apparatus for automatically lighting burners at a distance; (4) apparatus for the domestic uses of gas; (5) also for domestic uses of coke; and (6) producers intended for the manufacture of poor gas or water gas, using, with advantages over other fuels, gas-works coke. The second division of competitions is that relating to essays or theses on any subject of interest to the gas industry. The papers must not be signed, and must be written in French. They must also be sent to the Société Technique before March 1, 1907. English manufacturers and others have before now entered for these competitions; and we hope that some will do so during the year 1906-7, and will meet with every success.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Annual Meeting in Leeds.

The Annual Meeting of the Association was held in the University Buildings, Leeds, on Saturday; and, as usual, it consisted of a business meeting followed by a lecture. A large company assembled in the handsome University Library when the meeting opened under the chairmanship of the Retiring President, Mr. E. J. SUTCLIFFE, of Bradford.

Mr. SUTCLIFFE said he had now reached the end of the period for which the members' kind votes had made him President; and before formally inducting his successor, he wished, with deep feeling and with the utmost cordiality, to thank all individually and collectively for the support so freely given to him. All would agree that their past year had been a successful one, and that the meetings had been enthusiastic and profitable. For this he did not claim the credit, as it had been secured by the support and co-operation of all, and especially of the members of the Council. Again he thanked them all, and bespoke the same loyal assistance for his successor, Mr. G. W. Fligg, of Dewsbury, whom he now asked to assume the presidency and the further conduct of the day's proceedings.

THE NEW PRESIDENT.

Mr. FLIGG was most heartily received by the members. He assured them that he felt greatly honoured in having been placed in such a position. He had been connected with the Association from the very first, and had never regretted the share he had had in the original preliminary meeting at Dewsbury. He was more hopeful than ever of its prospects, believed in it more strongly than ever, and intended to do his utmost for it during his year of office. He hoped he might be supported by a good Council—all workers—and that the year would see a vast increase of members. He bore testimony to the faithful hard work of the Retiring President, and instanced the memorably interesting and profitable visit to his works when they were closed down for repairs, and all the plant was opened for detailed inspection, as an instance of the privileges secured for members by the Association which would hardly have been obtained individually.

ANNUAL REPORTS AND ELECTION OF OFFICE-BEARERS.

The SECRETARY (Mr. C. T. B. Roper) presented his report on the year's working, and called attention to the additions to the library purchased with part of the balance shown in the Treasurer's report. The membership was now 86, in addition to 10 honorary members. This report and that of the Treasurer (Mr. H. D. Lumb) having been accepted, officers were elected as follows:—

President.—Mr. G. W. Fligg, of Dewsbury.
Senior Vice-President.—Mr. J. H. Hill, of York.
Junior Vice-President.—Mr. J. F. Smith, of Scarborough.
Ex-President.—Mr. E. J. Sutcliffe, of Bradford.
Secretary.—Mr. C. T. B. Roper, of Bradford.
Treasurer.—Mr. H. D. Lumb, of Mirfield.
Council.—Messrs. Butterfield (Silsden), W. Cranfield (Halifax), J. Demain (Otley), E. Gillett (Bradford), F. Scholefield (Dewsbury), and S. W. Shepherd (Frizinghall).
Auditors.—Messrs. E. E. Stones (Elland) and C. H. Turner (Mirfield).

VOTES OF THANKS.

A comprehensive vote of thanks to all the retiring officers was proposed in cordial and graceful terms by Mr. FELL and seconded by Mr. CAWTHRA, who said the work of the year had set a standard for the officers of other years. After the vote had been carried,

The PRESIDENT called upon Mr. Cranfield to respond on behalf of the officials.

Mr. CRANFIELD said, on behalf of his colleagues, he thanked the members sincerely, and assured them that complete harmony and hearty co-operation had marked all their proceedings. He wished to bear his personal tribute to their ex-President's work and influence. They all appreciated his suavity, wisdom, zeal, and tact, and knew how his generous readiness to help the young men and the charm of his personality had won him no small degree of personal devotion among those who knew him intimately. His colleagues on the Council had seen much of these characteristics, and had profited by them; and to him they adjudged the main share of the Association's thanks. Their Secretary was a model one, and not the least of his claims on their thanks was the fact that he accepted their unanimous nomination of him for another year's service. The Treasurer was their "safe" man—quiet, watchful, and tenacious—and their treasury could not have a better custodian. The Council were glad to co-operate with such officials and follow their guidance. He would remind them that in purchasing books for the library they desired not only to bring within the reach of all the members standard works of reference that most of them would hardly be likely or able to buy for themselves, but to collect so complete a range of books bearing on gas questions that members could examine any they contemplated buying, and so be guided in their choice.

On the proposition of Mr. SCHOLEFIELD, seconded by Mr. BENN, thanks were also voted to the University authorities for placing the Library and Lecture Theatre at the service of the Association. Both speakers emphasized the exceptional privilege thus enjoyed, and the kindly sympathy and good wishes manifested in this and other ways.

Mr. CRANFIELD, in supporting the resolution, informed the meeting that Dr. W. A. Bone, F.R.S., the newly appointed Professor of Fuel and Metallurgy—the first occupant of what is really the first academic chair of "Gas Manufacture" and its allied subjects—had written to him accepting honorary membership in the Association, and assuring him that he would do all in his power to further its interests.

ADDRESS BY MR. THOMAS NEWBIGGING.

Mr. T. NEWBIGGING then delivered his promised address, which will be found on p. 301. It was most cordially received, and at its close

Professor SMITHELLS, F.R.S., proposed a vote of thanks to the lecturer, saying that it was a sincere pleasure for him thus to respond to the President's request. Before referring to Mr Newbigging's address, he wished again to say how warmly the University authorities welcomed the members within their walls, and how glad they were to know of the Association's continued success. When he spoke last year he had the gratification of announcing that the University was about to take long-contemplated steps to advance the interests of the gas profession by making provision for a department which should particularly concern itself with the exposition and elucidation of the problems associated with fuel. He was now glad to inform them (though they had already heard it through other channels) that these steps, or some of them, had now been taken. The new department had been constituted, and at its head had been placed Professor Bone, who was with them that afternoon. They had revised the plans, and contractors were about to commence the actual erection of a separate building for the accommodation of the departments of mining and fuel and metallurgy. It would be erected near the existing buildings, on such a spot that money would not have to be spent on ornamentation that could be better utilized for equipment. This extension would cost £9500, and would be admirably adapted for its work. It was, under heavy penalties, to be completed by next June, and by the beginning of the next academic year the University would be able to offer full courses of study in the subject of fuels and their relation to gas manufacture. He had on other occasions said how much the success of the new venture and the extent of its development would depend on the material and moral support of the gas industry; and there that day he invited for it, from them and those whom they typified—the young men of the profession—sympathy, interest, and willingness to avail themselves of its privileges. From their point of view, at the present juncture, and facing both the gas industry and its University students, Professor Bone and he could offer no better advice than that which had been so admirably and forcefully expressed in Mr. Newbigging's words They had been most opportune and weighty, and the address had been a delight to them all. He had not had the pleasure of a personal acquaintance with the lecturer before that afternoon, though his name, his reputation, and his work had, of course, been familiar to him ever since he first began to take an interest in gas matters. Mr. Newbigging had informed him that he was born in Glasgow, was about one-quarter a Yorkshireman, and had lived long in Lancashire. Such a history was bound to have resulted in an exceptional personality.* They all knew that Mr. Newbigging had attained great practical success in his profession, and great honour and respect for the dignity and beauty of his character; and that afternoon they had found that his attitude towards life and men had been reflected in his address. He had called himself an old man. Listening to that discourse, they absolutely refused to agree with this designation. Elderly they might admit; but old—never! As the years passed over his own head, and, as he looked at Mr. Newbigging, he really did not feel comfortable with the old Greek saying, "Whom the gods love die young;" but he was glad to interpret it in other ways: "Whom the gods love die young in spirit." Mr. Newbigging was a fine example of a beautiful age, young in spirit. As they had delightedly followed his words, they had felt that he spoke like a sage and a prophet; but they had also realized him as a warm-hearted, tender, and sympathetic fellow human being.

Professor W. A. BONE, F.R.S., in seconding the vote of thanks, said it had given him great pleasure not only to meet for the first time so many people engaged in the gas industry, but to be present on an occasion when so venerated a member of it addressed them in words which were so stimulating and full of mature thought and records of thought translated into action. He declared that nothing could be more appropriate to the venture upon which that University was just then embarking than Mr. Newbigging's address. He did not know if the lecturer had had their Leeds undertaking in mind; but, if not, some occult means of thought-transferrence had operated between Leeds and Manchester, and had revealed their aims and hopes and advice in the form of their lecturer's winning words. Mr. Newbigging could not possibly have prepared a way for them and their on-coming gas students more appropriately than by that afternoon's talk; and therefore he felt two degrees of thanks—not only for the intrinsic value of the address, but for its value relative to their new work. If he might now be allowed to embrace so favourable an opportunity, he should like to speak briefly of that work. Of course, he spoke

* Those who know how much of Professor Smithells' own life and experience is associated with the same three places see much force in this argument.—ED. J.G.L.

with a degree of hesitancy, because he did not wish to be thought of as blowing his own personal trumpet. It was of much greater importance that he should set before them the ideas uppermost in the minds of the University authorities and of Professor Smithells when he first moved in this matter. They recognized that the work of the gas industry was a branch of applied science—allied to applied chemistry, physics, and engineering—but that of these nothing was more cognate than applied chemistry. So when this new department at Leeds was decided upon, the first occupant called to the new chair was one who had mainly concerned himself with the solution of the chemical problems of the subject. It had so happened that no University had hitherto concerned itself closely with the gas engineer's profession; and, in the steps they had taken, he felt sure that most would agree with him that these were directions in which they could assist in the more immediately professional training of gas engineers—that this training was one suited to University courses and conditions, and one that could be recognized by suitable diplomas. Therefore, in a few months' time there would be courses provided both for those who were about to enter the profession and for those already in it. He hoped that when they had thus got their work established, all present would make the best uses they could of the resources of their industry. Many of them lived near, and he hoped they would feel that the new department would do its best to help them in their general or individual difficulties. He was glad Mr. Newbigging had emphasized the need of research methods in the gas industry. He did not wish to seem egotistical, but to him the one great attraction about academic scientific life was the opportunity of research, both by oneself and in helping others with a lifting hand and a guiding voice. It would not be his intention to make his department simply one for imparting knowledge already attained and assured, but ever to engage in pioneer work, so as to obtain new knowledge and gather fresh facts; and these not only in immediate relation to the details of the gas industry, but such as were of value as pure science. He thus hoped he might be enabled to pass over to their profession research methods and the type of mind that these methods evolve. He would always welcome all who came, whether with or without problems they were anxious to solve, desirous of exercising themselves in such methods of research. To the equipment of their department much thought had been given. A sum of money which he considered adequate had been allotted to him, and he was busily engaged thinking out how to apportion it. He quite agreed with Mr. Newbigging in the desirability of experiments in heating by high-pressure gas; and he was arranging even then for the laying down of plant for compressing gases, not only in order that his students might know how to do this, but so that they might institute inquiries into the use of compressed gases and the results of such use. This apparatus his department would thus have from the outset. He wished again to give a hearty welcome to all interested in gas matters to enter themselves as students; and he hoped that many would become gas research students.

Mr. J. H. Brearley (Longwood), the President of the Manchester District Institution of Gas Engineers, supported the vote of thanks. He said he should have been amply content to have been only a listener to Mr. Newbigging and the two Professors; but he was glad to add his quota to the expressions of praise and delight. The lecturer had not only worked for fifty years in gas affairs, but loved the industry; and he (Mr. Brearley) was glad of the opportunity they had all had of meeting one whose fame was on all tongues, and whom they all, especially the younger ones, regarded with veneration and admiration. He was glad they had heard something more of the University proposals. They could all agree with Professor Bone that the end of research in gas matters was not yet, and that they could not in any degree foresee the possibilities of what might come from it. He was sure that all the Senior Associations and the Institution of Gas Engineers would watch with interest the new department.

Mr. R. H. Ginman (Tyldesley), the President of the Manchester and District Junior Gas Association, also supported the vote; expressing his pleasure at being present with his Yorkshire friends, and his great enjoyment of the fare they had provided for the annual meeting. He entirely associated himself with the expressions of admiration of Mr. Newbigging's lecture, whose echoes would be heard in many other quarters. He congratulated the Association, on behalf of the Manchester Association and in his own name, on their present position and promise, and on the work they had already accomplished.

The vote of thanks having been heartily carried,

Mr. Newbigging, in reply, thanked the members sincerely for the honour they had shown him in asking him to address them, and for their kind attention. He had not expected to find two professors in his audience, and he had felt somewhat diffident in their presence. They had, however, said many kind things about him, for which he thanked them warmly. He felt exceedingly glad for their assurances that his address had been appropriate to the circumstances of the time and to the surroundings. He had personally known Professor Smithells's father, and many of his coadjutors in Lancashire, before he became General Manager of the Caledonian Railway; and he was glad to recall those earlier memories now that he had met the son. He had known Professor Bone and his work for several years. He was pleased to meet him that day in his new sphere; and he extended his congratulations and good wishes for the great and lasting success of the new department of the University entrusted to him. On looking over his address while in the train, the fear seized him that members would think he was playing the part of Polonius in plying them with maxims and advice; but they had taken it in good part, without feeling annoyed. He trusted that the fate of Polonius might not overtake him. He wished to express the hope that the Association might continue to be a great success, and a growing success, in years to come, though of the certainty of this he had no doubt. These Junior Associations were familiarizing men with the facts and methods of science and their applications; and this was even better than mere technical knowledge. The older generations had had no such opportunities; and these Associations had a great part to play in the future. He was glad the Universities realized that gas was not "snuffed out," or in danger of such a fate. In the seventies, many good people lost their heads over the introduction and widespread adoption of electricity, and thought the final chapter of the prosperity of the gas industry had been reached. People foolishly parted with really valuable shares in gas undertakings, though he was able to stop many who were about to do so. With the usual rush of over-confidence and wild expectation often associated with a successful new venture, people imagined that electricity was going to do almost everything, and be available in every circumstance. In Lancashire, they then even played football by the electric light; and he himself once went to such a match. Gas touched their interests in many walks of life, and ever so many phases of life needed to bring their share to the making of a gas engineer. He had referred to the need of chemistry, physics, engineering, mathematics, &c.; but, in addition to all these studies, they must aim at being good men of business. He now begged them to join in thanking the President, whom he was glad to see in the position he occupied.

Thanks having been accorded to the President, the meeting closed, and the members subsequently had tea together.

Gas for Power.

I have said (remarked Mr. W. B. Esson, M.Inst.C.E., in his Presidential Address to the Civil and Mechanical Engineers Society) that, as a means of distributing power, electricity has no competitor; but recently efforts have been made to distribute not power, but fuel in the form of Mond gas, which may suit the requirements of some manufacturers better than power delivered electrically. The gas can be used either in gas-engines for driving purposes, or for heating; and the South Staffordshire Mond Gas Company are pioneers of this development. The Company have laid about 30 miles of pipes, and deliver gas between six and seven miles from the generating-house. During the first six months of this year, there were delivered to customers from the mains of the Company over 1700 million cubic feet, at an average price of rather under 2d. per 1000 cubic feet. Taking 80 feet per E.H.P.-hour as the consumption for the usual size of gas-engine met with, this means that the fuel cost amounts to 0·16d. per E.H.P.-hour. This is about what suction gas costs when generated on site; labour and capital charges in respect of the plant being included. I learn that the aggregate capacity of all the Mond gas plants at work gives an equivalent of about 240,000 B.H.P.; but as three-fourths of the gas is used for heating metallurgical furnaces and for other purposes where heat is required, it appears that power will not form the Company's chief source of revenue. In districts where heat as well as power is wanted, the system has every chance of success. There are no serious engineering difficulties in the way; and it must be remembered that gas distribution on a large scale for lighting is already an existing thing. If all the gas distributed from the eight stations of the Gaslight and Coke Company were used for power purposes, it would represent 450,000-horse power of gas-engines running continuously for 3000 hours per annum. The combined output of the 62 electrical stations in London represents under 60,000-horse power for the same period.

Paris Gas Supply.—At the meeting of the Paris Municipal Council last Tuesday, M. Georges Desplas read a report prepared by him on the subject of the future control of the gas supply of the city. The question of direct as against indirect management of the gas undertaking has been under consideration since the early part of the year; and M. Desplas has now reported in favour of the latter, on the basis of a scheme prepared by the Prefect of the Seine. This means that the practical working of the concern will be delegated, but that the Municipality will retain their financial interest in it.

New Edition of Professor Lewes's "Service Chemistry."—In previous issues of the "Journal" we have noticed the above-named work, which is a short manual of chemistry and its applications in the naval and military services; and we are pleased to find that it has now reached a third edition, a copy of which we have received from Professor Lewes. It is the combined production of himself and Mr. J. S. S. Brame, F.C.S., the Demonstrator in Chemistry at the Royal Naval College, with which establishment, as our readers are aware, the Professor has been connected for some years. Pending the fuller notice of the book which we hope to give in an early number, we may say that it has been entirely re-written, and new matter added which greatly enhances its technical value.

REMOVAL OF NAPHTHALENE FROM COAL GAS.

By Alfred H. White and Joel M. Barnes.

[Paper presented at the Meeting of the Michigan Gas Association.]

(*Concluded from p.* 245).

Change of Viscosity of Tar with Temperature.—Before the error in sampling was discovered, considerable work was done on the viscosity of tars at various temperatures, with the idea that the differences in viscosity from day to day might be an important factor governing the removal of tar by the Pelouze separator. All the tests were on this apparatus at Ann Arbor; and those reported here were made with a Redwood viscosimeter.

The curve of the accompanying diagram, showing the viscosity of the Ann Arbor Pelouze tars, is plotted from observations on five tars drawn from the separator under different conditions. All the points are recorded. The agreement is as close as can be expected, and does not indicate any difference in the viscosity of the tar from day to day which can be considered of importance. The influence of slow and rapid cooling of the tar from a higher temperature was also investigated, and likewise showed no noticeable effect on viscosity. The experiments are therefore of only negative value; but the curves are presented here, as no results of a similar sort have been noted in the literature, and the change of viscosity with temperature may be of interest.

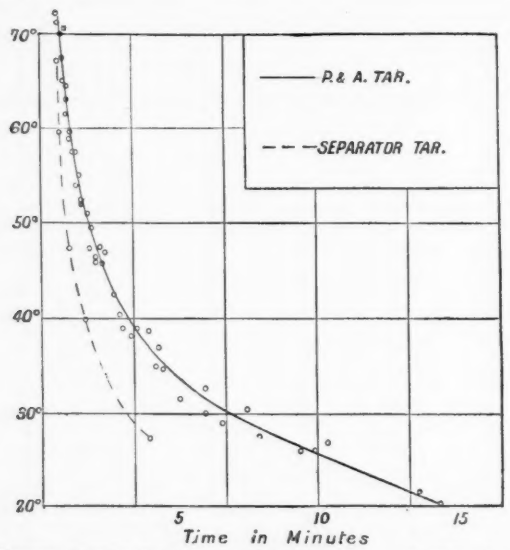


Diagram showing the Influence of Temperature on the Viscosity of Pelouze Separator Tars and Drip Tar.

The second curve on the diagram represents the viscosity curve of a tar drawn from a drip on the main connecting the Pelouze separator and the secondary condenser. It represents the tar which passed the Pelouze with the gas, and separated out a little later in the system. It has a lower specific gravity, and is also much less viscous, especially at ordinary temperatures.

Equilibrium between Heavy Tar Constituents and Naphthalene Vapours.—The question of the conditions governing equilibrium between the naphthalene dissolved in the tar and as vapour in the gas has been studied further this year, but has proved a most difficult subject. The method employed by us last year gave the equilibrium existing between a sample of tar with gas kept continuously saturated with naphthalene vapour—the whole system being at constant temperature. This did not give the conditions prevailing in the works, as was recognized and explicitly stated; but it gave a good indication of the very powerful solvent power which tar has for naphthalene. We have not been able to devise a method which would satisfactorily reproduce in the laboratory the conditions prevailing in the works, but have made some experiments which throw a little more light upon the absorbent power of the heavier constituents of the tar.

In these experiments, air or gas was slowly drawn through a U-tube containing naphthalene, and passed from that to a T, where the stream divided—one-half passing through a tube containing the tar or pitch under investigation, and the other half bye-passing this tube. Each stream passed through a naphthalene absorbing train, and thence to its own aspirator. The amount of naphthalene in the bye-passed gas represents that at the inlet of the tar absorption-tube; and the amount at the outlet, that escaping absorption by the tar-tube. The difference gives, of course, the amount taken up or given off by the tar.

The first test was made on Pelouze tar from the Ann Arbor works, which analysis showed to already contain 10·8 per cent. of naphthalene. About 10 grammes of this was mixed with asbestos, to offer a larger surface, and placed in the apparatus kept at 25° C. or 73° Fahr. Gas saturated with naphthalene at 37° C. (98° Fahr.) was drawn through at the rate of 1 cubic foot in 12 hours, which was so slow that it was judged that equilibrium would be completely attained. As will be noted, the gas was supersaturated at the temperature of the tar-tube, and would therefore deposit naphthalene. It actually left the tube saturated at 20° C. (68° Fahr.). This indicates a slight absorption of naphthalene by the tar, represented by the difference required to saturate the gas at 73° and 68° Fahr. But the amounts involved are so small at these temperatures that too much reliance should not be placed upon this small difference, and we must consider that the tar at this temperature has only a slight capability of absorbing napthalene, if it has any at all. The temperature of a duplicate tar-tube was raised to 32° C. (90° Fahr.), and gas supersaturated for this temperature slowly drawn through. It left the apparatus saturated at 31° C. (88° Fahr.); again a scarcely appreciable difference, and showing no action on the part of the tar.

The temperature of the tar-tube was then raised to 52° C. (126° Fahr.). The gas passing in was not quite saturated for this temperature, being saturated for 47° C. (117° Fahr.); but it left the tube saturated at the much lower temperature of 39° C. (102° Fahr.). This difference—126° to 102° Fahr.—is too large to be due to experimental error. The tar is very evidently taking up naphthalene from the gas at this temperature. A repetition of the experiment at a slightly higher temperature showed a similar result. The results are summarized below.

Series I.—*Ann Arbor Pelouze Separator.*

	Entering Gas Saturated at	Temperature of Tar-Tube.	Exit Gas Saturated at
1	37° C. = 98° F.	23° C. = 73° F.	20° C. = 68° F.
2	48° C. = 128° F.	32° C. = 90° F.	31° C. = 88° F.
3	48° C. = 117° F.	52° C. = 126° F.	39° C. = 102° F.
4	52° C. = 125° F.	54° C. = 129° F.	45° C. = 113° F.

As being a different tar upon which to try a similar experiment, a hydraulic main tar from Detroit, carrying 5·1 per cent. of naphthalene, was chosen. This showed an absorption of naphthalene at all three temperatures tested, as shown below.

Series II.—*Detroit Hydraulic Tar.*

	Entering Gas Saturated at	Temperature of Tar-Tube.	Exit Gas Saturated at
1	44° C. = 111° F.	38° C. = 100° F.	31° C. = 88° F.
2	44° C. = 111° F.	51° C. = 124° F.	32° C. = 90° F.
3	43° C. = 109° F.	61° C. = 142° F.	42° C. = 107° F.

Carrying the subject a step further, a pitch was next tried; and, as an extreme case, a hard and brittle pitch from a hydraulic tar from Monroe was chosen. The following results were obtained.

Series III.—*Monroe Pitch.*

	Entering Gas Saturated at	Temperature of Pitch-Tube.	Exit Gas Saturated at
1	46° C. = 115° F.	50° C. = 122° F.	25° C. = 77° F.
2	68° C. = 154° F.	70° C. = 156° F.	41° C. = 106° F.
3	85° C. = 185° F.	90° C. = 194° F.	66° C. = 151° F.

A comparison of these three tars and pitches is interesting. The Ann Arbor Pelouze separator tar is the only one tried below 38° C. (100° Fahr.). At the temperatures below this, the tar was saturated so that it could not absorb any more naphthalene, or was so cold that, in spite of the large surface, it did not react at measurable rate. Whichever was the cause, it is useless for further naphthalene absorption below 32° C. (90° Fahr.). At the next temperature tried, it was able to take out naphthalene so that, though the temperature of the tar was 126° Fahr., the gas gave up so much of its naphthalene that it went out saturated at only 102° Fahr.

The Detroit hydraulic tar and the Monroe pitch were tested at so nearly this same temperature, that the three results can be compared directly.

Temperature of Tar-Tube.	Exit Gas Saturated at	Naphthalene in Tar at Close of Experiment.
Ann Arbor Pelouze . . 126° F.	102° F.	11·6 per cent.
Detroit hydraulic . . 124° F.	90° F.	5·9 ,,
Monroe pitch . . . . 122° F.	77° F.	2·1 ,,

This shows that at the same temperature the pitch is able to take out the naphthalene more completely than the hydraulic tar, which in turn is better than the Pelouze tar. The comparison is not quite a fair one, however, for, as will be seen from the last column, the Pelouze tar laboured under the disadvantage of containing twice as much naphthalene as the pitch. It is possible that the tars would have shown as good a result if they could have been started with about 1 per cent. of naphthalene, as the pitch was. However this may be, there can be no denying that these experiments with pitch show very strikingly its power to reduce the amounts of naphthalene far below that required for saturation. The second experiment of Series III., with Monroe pitch, illustrates this. Starting with about 1 per cent. of naphthalene, at 158° Fahr. it took up naphthalene from the gas coming to it until it had absorbed 4·5 per cent. in addition to what it held previously; so that it contained about as much as the usual hydraulic main tars. While thus working at 158° Fahr. it removed a mean amount of 84 per cent. of the naphthalene coming to it, and allowed the gas to go forward saturated at only 106° Fahr. Since the gas came to the pitch-tube with more naphthalene than

it had when leaving, any error due to non-attainment of equilibrium would make this figure of 106° Fahr. too high, and would mean that the tar was really doing more work than it was getting credit for. It is believed that this experiment gives a fair picture of the way in which pitch acts in removing naphthalene in the stand-pipe and the hydraulic mains.

An attempt was made to get at the equilibrium from the other side by mixing pitch with naphthalene, and noting the amount of naphthalene given back to gas free from naphthalene which was aspirated through it. To afford as large a surface as possible, the pitch was melted and mixed with ten times its weight of coarse sand. While still warm, the naphthalene was stirred in, and the mixture at once bottled to prevent volatilization of the naphthalene. Dry air at a specified temperature was drawn through slowly, and the amount of naphthalene taken up was estimated. A new pitch-tube was used for each experiment, so that the amount initially present was always the same, and that withdrawn in any experiment was never more than 4 per cent. of that initially present. The following are the results.

SERIES IV.—*Monroe Pitch with 3 per Cent. of Added Naphthalene.*

Temp. of Pitch-Tube.	Exit Gases Saturated at
60° C. = 140° F.	32° C. = 89° F.
80° C. = 176° F.	39° C. = 102° F.

SERIES V.—*Detroit Condenser Pitch with 3 per Cent. of Added Naphthalene.*

Temp. of Pitch-Tube.	Exit Gases Saturated at
60° C. = 140° F.	33° C. = 91° F.
80° C. = 176° F.	40° C. = 104° F.

These two sets agree very closely with each other, and also take their place in Series III., which approached equilibrium from the other direction well enough to give them considerable credence as actually indicating the conditions of equilibrium under these conditions. If we take all the results for the Monroe pitch in both series, we have—

Series.	Temperature of Pitch-Tube.	Exit Gas Saturated at	Napthalene in Pitch at Close of Experiment.
III. . .	50° C. = 122° F. ..	25° C. = 77° F. ..	2·1 per cent.
IV. . .	60° C. = 140° F. ..	32° C. = 89° F. ..	2·9 ,,
III. . .	70° C. = 158° F. ..	41° C. = 106° F. ..	5·7 ,,
IV. . .	80° C. = 176° F. ..	39° C. = 102° F. ..	2·8 ,,
III. . .	90° C. = 194° F. ..	66° C. = 151° F. ..	11·5 ,,

The fourth result in the list is out of accord with the others; but its lower percentage of naphthalene undoubtedly accounts for it in large degree.

These figures show that pitch is able to absorb a considerable quantity of naphthalene at high temperatures; but they do not indicate how great must be the absorptive power exerted. Considering the results of Series IV., we find—

Temperature of Pitch-Tube.	Milligrammes of Naphthalene to Saturate 1 Cubic Foot of Gas at this Temperature.	Exit Gas Actually Saturated at	Milligrammes of Naphthalene to Saturate 1 Cubic Foot of Gas at this Temperature.
60° C. = 140° F. ..	408 ..	32° C. = 89° F. ..	45
80° C. = 176° F. ..	1250 ..	39° C. = 102° F. ..	84

This shows that at the lower temperature this pitch, containing 3 per cent. of naphthalene, allowed the gas to take from it only 45 out of the 408 milligrammes of naphthalene the gas demanded, and at the higher temperature it only yielded 84 out of the 1250 milligrammes required to saturate the gas. At the lower temperature, the gas had to go forward only 11·2 per cent. saturated; at the higher temperature, only 6·8 per cent., and this though the pitch already contained 3 per cent. of naphthalene.

The conclusions reported in our paper last year, claiming this great absorbent power for pitch at rather high temperatures, were vigorously controverted by Dr. Colman in the "JOURNAL OF GAS LIGHTING" on theoretical grounds.* Dr. Colman believes that the governing factor is the increasing vapour pressure of the naphthalene at the higher temperatures, and he regards the tar as a purely passive receptacle. In view of this evidence, the claim that pitch absorbs more naphthalene at the higher temperatures simply because the vapour pressure of the naphthalene is higher, seems to be hardly tenable. The vapour pressure of the naphthalene does increase rapidly; but the absorptive power of pitch increases more rapidly up to a maximum temperature that has not yet been determined, but which probably exists.

The influence of temperature on the absorption of naphthalene is also illustrated by Series I. with the Ann Arbor Pelouze separator tars. In Experiments Nos. 2 and 3 of this series, the amount of naphthalene coming to the tar-tube is the same—it being saturated at 117° to 118° Fahr. In Experiment No. 2, the gas leaves the tar-tube practically saturated—going out saturated at 88° Fahr., while the tube is at 90° Fahr. In Experiment No. 3, the tar takes up naphthalene, and the gas goes out only 36 per cent. saturated for the temperature of the tar-tube. It actually went out at a temperature of 126° Fahr., but only contained naphthalene enough to saturate it at 102° Fahr. This would indicate that the tar was saturated for the lower temperature of 90° Fahr., but not the higher temperature of 126° Fahr.—all other conditions being the same.

There is one other bit of evidence on the subject. Sample No. 3 of Monroe pitch (Series III.) had absorbed 10·5 per cent. of naphthalene at 194° Fahr. After the experiment, the tube was corked up and left on a shelf. After a day or two, crystals of naphthalene were noticed in the tube, which increased in number. They must have come from the gas originally. The gas as it went into the tube was not quite saturated, and it left it much less saturated; so that the deposition of naphthalene cannot have been due to an initially supersaturated gas. The only explanation is that the tar was able to hold the naphthalene in solution at the higher, but not at the lower, temperature; and that the usual variations in room temperature had caused this free naphthalene to crystalize in its well-known manner.

In considering the results of the absorption of naphthalene by pitch, it seemed of interest to try to analyze the process further by differentiating between the pitch proper and the so-called free carbon. Accordingly, a tube was made up of pitch and sand, as usual, and thoroughly extracted with chloroform. The soluble pitch, after evaporation of the chloroform, was mixed with more sand, and exposed to gas carrying naphthalene in the same way that the pitches had been. At 86° C. (187° Fahr.) this extractive matter from the Monroe pitch dissolved 5·1 per cent of naphthalene, 92 per cent. of which was later recovered by aspirating air through it. At 60° C. (140° Fahr.), only 1·8 per cent. was taken up, of which 96 per cent. was afterwards recovered. This does not differ much from the behaviour of the pitch.

Absorption of Naphthalene by the "Free Carbon" of Tar.—The tube containing the residue of free carbon and sand left after extraction with chloroform was tested in a similar way, to determine whether it could absorb naphthalene. The tube was maintained at 80° C.; the entering gas was 71 per cent. saturated for this temperature, and the gas leaving was on the average only 24 per cent. saturated. The amount of naphthalene absorbed was 96 per cent. of the weight of the free carbon. It was then sought to recover this naphthalene by reversing the process, and drawing dry air through the tube at the same temperature. The naphthalene tube in the ice-bath came to a constant weight after twelve hours, when 49 per cent. of the naphthalene had been recovered. By heating the carbon-tube to dull redness, 13 per cent. more was recovered; but the carbon burned off, and doubtless some of the naphthalene did also. The experiment has been repeated a number of times. This free carbon from the Monroe pitch can take up almost 10 per cent. of naphthalene at 80° C. and 6·6 per cent. at 70° C. (158° Fahr.); but it has never been possible to recover more than two-thirds of it by drawing air through. Whether this free carbon is equally effective in the gas-mains must be a matter of surmise. There are, of course, many other vapours present in much larger quantity than naphthalene, and there is no reason for believing that naphthalene would be the sole recipient of the carbon's attention; so that the practical importance of the free carbon may not be very great. A single experiment was made upon coke to see what its absorptive power would be; but, under the same circumstances, it only took up 0·3 of 1 per cent. We have also tested the effect of asbestos, as suggested by Dr. Colman as a possible source of error in our work, but have not found it to absorb more than the merest trace of naphthalene.

Summary and Conclusions.—The experiments presented in this paper show that the suspended tar and water in an unpurified gas are not uniformly distributed throughout the cross section of the main, but are far greater at the edge than near the centre. It is difficult to fulfil all the complicated requirements needed by our work, and use any of the usual methods for obtaining a fair sample of gas, and all our results are open to the suspicion that they do not correctly represent the composition of the gas in the main. Fortunately, the error in the amount of naphthalene in the gas is not so large as that in the amount of tar and water. The error in the suspended tar is also not large beyond the Pelouze tar-separator; and it is believed that all the results on naphthalene throughout the system and those on suspended tar beyond the Pelouze are fairly reliable.

To obviate the possible errors due to filtering the gas through the separated tar, a miniature high-speed centrifugal separator was built, which took the gas from the main, and mechanically separated more than 95 per cent. of the suspended tar without change of temperature. The results obtained by this machine on tests for naphthalene in the gas agree well when compared with tests made according to the methods reported a year ago; and, as a common error in the two methods is improbable, they indicate that both give fairly correct results. The paper presents a careful study of conditions at the Pelouze tar-separator at three works. They all show a larger amount of naphthalene in the gas coming to and leaving that apparatus than was reported last year. This is attributed largely to the higher temperatures prevailing at the Pelouze, and in part to the more rapid condensation incipient to the increased production, which does not allow attainment of equilibrium. The amount of naphthalene in the gas at the inlet to the Pelouze separator in these works is greater than at the outlet. The agitation in the tar-separator aids in bringing about equilibrium between the naphthalene in the tar and in the gas. The centrifugal tar-separator acts little more efficiently than the Pelouze, provided no drop in temperature is allowed in it, and probably works in the same way. If, as seems apparent, the gas does not have time to come to equilibrium with the tar with our rapid methods of condensation, it would seem to indicate that baffle-plates or stirrers might with

* See "JOURNAL," Vol. XCII., pp. 526, 596.

advantage be employed to agitate the gas in the earlier stages of the condensing system, as is reported to have been successfully tried in England by Mr. Everitt.*

Under the conditions observed this year, rather more naphthalene than is desirable tends to pass the Pelouze separator. At the higher temperatures a good deal of light oil also passes it; but whether this is sufficient in quality and quantity to take care of the naphthalene in the later stages of the condensing system, is a point we have been unable to determine, because of the difficulty of estimating these small amounts of light oil.

A laboratory study of the equilibrium between the naphthalene as vapour in the gas and dissolved in the tar, confirms the conclusion announced last year, that the heavy constituents of the tar have very great solvent power for naphthalene at high temperatures. The free carbon accompanying the tar can also occlude naphthalene. Most of the naphthalene of the gas is probably absorbed by these heavy tars at a rather elevated temperature; but it must not be understood that all of it will or can be so dissolved. As was shown last year, there is a gradual drop in the amount of naphthalene vapour as the gas passes from the standpipes to the Pelouze tar-separator, where it should practically all be dissolved in the tar. This final elimination of the naphthalene is probably brought about by the lighter constituents of the tar which have not yet condensed at the higher temperatures, and therefore could have exerted no solvent action.

The influence of these lighter oils has not been discussed in this paper because of difficulties in sampling and analysis. A study of their behaviour is most important, but will be difficult to make with present methods. The plan thus far followed, of making tests in various works, has been of great value as a means of indicating which conditions are common and which are exceptional. The discovery that tar in the scrubbers was instrumental in causing naphthalene stoppage would probably not have been made so quickly in any other way. The objections against this method of procedure are the increasing number of variables which are known to affect results, and the impossibility of controlling all these conditions in gas-works, however willing the management may be; the difficulty of getting an accurate sample from a large main; the difficulty of transporting and erecting an outfit to handle large samples of gas; and the uncertainty of results from a small one, especially in regard to the light oils.

The best results can only be obtained by a careful collection and observation of all data which can have a possible bearing on the subject; all conditions being kept constant except the one under observation. We believe that the result can be obtained with closest regard to practical working by connecting a separate condensing plant to a full-sized retort in a full-sized bench, so as to get working conditions. All the gas from this one retort should pass into the condenser, which should be adjustable in size to allow a study of rapid and slow condensation. There should also be a tar-separator and a meter to register the rate of flow. A small purifier and a relief holder connected to a photometer bench would permit of a determination of candle power. It is believed that a plant of this sort would allow a study of all the most important factors of condensation, as well as those pertaining to the reactions in the retort, and would give results of far more value than a continuation of the present system of making tests at different gas-works.

* See "JOURNAL," Vol. LXXXVIII., p. 700.

Auditing Municipal Accounts.

At the recent conference in London of the Society of Accountants and Auditors, regret was expressed, by means of a resolution proposed by Mr. C. H. Wilson, of Leeds, that effect has not been given to the unanimous recommendations of the Joint Select Committee of both Houses of Parliament on Municipal Trading in regard to the appointment of professional auditors of municipal accounts. Mr. Wilson said they could not have any objection to the Local Government Board supervising the reports which auditors might send in, or to the holding of inquiries as to what money was to be spent, or the seeing that moneys had been properly expended for the purposes for which they had been sanctioned. Mr. F. Walmisley, of Manchester, who seconded the resolution, said that, having regard to the fact that there was now a total of something like 400 millions sterling largely invested in the trading concerns of corporations, he thought it was in their favour to contend that at all events the accounts of these bodies ought to be more than they were now in the hands of gentlemen who were versed in all the intricacies of commercial undertakings. The trend of the times in commercial administration was in the direction of the influence and control of the Socialist element. The working classes were to-day more and more becoming members of local authorities, and their views and policies were entering into the control of corporate bodies. Consequently there should be some increase of control in regard to the spending of money by corporations.

The "Standard" Purifier-Grids.—In the article on this subject in last Tuesday's "JOURNAL," the quantity of gas passed by the purifier at Kingston-on-Thames was, by a clerical error, given as 154,800,000 cubic feet. We are asked by Messrs. Kirkham, Hulett, and Chandler to state that the figures should have been 124,873,000 cubic feet.

REGISTER OF PATENTS.

Regulating the Temperature of Retort-Ovens.

DOHERTY, H. L., of Madison, Wis., U.S.A.

No. 19,716; Sept. 29, 1905. Date claimed under International Convention, Oct. 25, 1904.

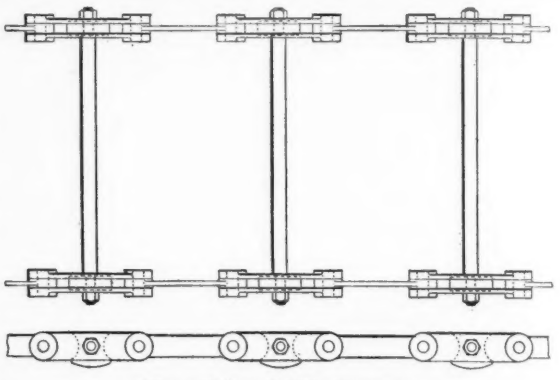
This invention—which consists in conducting combustion within a deep fuel bed by means of air and carbon dioxide, regulating the proportion between the quantity of air and the carbon dioxide introduced into the producer, and regulating the amount of such mixture of air and carbon dioxide so as to avoid objectionable slagging of the fuel and conducting the gas unburned to the point of use—is fully described and illustrated on p. 309.

Coke-Conveyors.

EDGAR ALLEN AND CO. and C. W. JAMES, of Sheffield.

No. 22,929; Nov. 8, 1905.

This invention relates to conveyors of the chain type, for moving hot coke from coke-ovens and the like. They are formed, as shown, of two or more chains in parallel lines; each chain consisting of a series of double links connected together by short studs or pins with a corresponding series of single links. Between each pair of double links is placed a skate or runner, held in position by a pin formed on the end of a bolt or stay with a nut. The other end of the bolt or stay is connected to a corresponding pair of links and skate in a companion chain; so that each bolt or stay answers the purpose of forming trunnions for the skates as well as for securing the companion chains together in parallel lines. All the links and short studs by which they are connected together are made of manganese steel, in the following manner: The studs are formed of rectangular section in the centre,



Allen and James's Coke-Conveyor.

and are driven securely into corresponding rectangular holes in each end of the single links. The ends of the short studs, which pass through the holes or eyes in each end of the double links, are made round to fit easily in same. Each part of the double link is likewise provided with a circular hole mid-distance between each pair of eyes, to receive the reduced end or pin of the stay bolt which carries the skate, and which also secures each pair of double links together. The skate or runner (likewise made of manganese steel) is provided with a circular hole to receive the pin or trunnion end of the stay bolt—made in ordinary steel. The wearing edge or face of the skate is made so as to extend some distance below the links between which it is secured, and is likewise splayed out so as to increase its transverse bearing. The longitudinal bearing is rounded like a rocker, so as to reduce the amount of surface in contact with the conveyor trough or plate, thereby reducing friction.

Charging and Discharging Gas-Producers.

WESSELSKY, L., of Dresden.

No. 20,445A; Oct. 10, 1905.

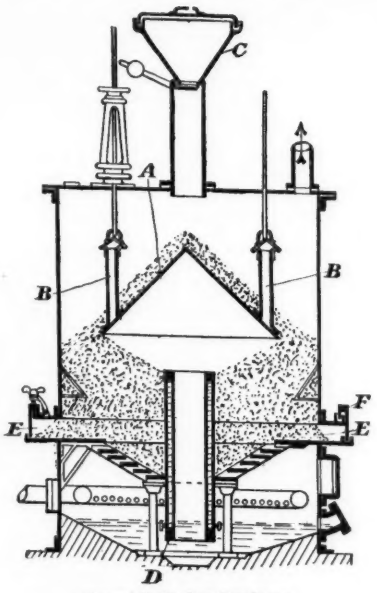
This invention relates to a generator for the production of gas from coal or the like, wherein the column of coal has two supports, one of which may consist of an inverted cone. In combination with the grate, there is a tube for the reception of any surplus coal that may be supplied to the space beneath the cone or fuel support—the tube dipping at its lower end into a water-filled tank.

The fuel-distributing device A [p. 327] is in the form of a movable hollow cone; the fuel falling on to the top of the cone and being distributed evenly over its surface. Tubes B serve as supports for the cone and at the same time as conduits through which the gas generated beneath it can escape into the upper part of the apparatus on its way to the outlet. As the cone is heated by the ascending gases, the coal resting upon it becomes dry; and the steam from the wet coal is led away with the gas—the vapour being afterwards separated from the gas in any suitable manner. The cone is made movable vertically by means of screw spindles and hand-wheels, so that the height of the cone above the grate (and relatively to the fuel-inlet pipe C) can be controlled according to the quantity of coal to be gasified and the work to be done by the apparatus.

To render the feeding of fuel to the grate as regular as possible, and to maintain a definite angle of repose of the fuel below the cone (*i.e.*, the coal fed in rests at a certain angle, according to its mass and condition and according to the surface of the coal on the grate), there is a

tube D arranged in the middle of the grate and movable vertically—being provided with a water-jacket.

In producers of this kind as heretofore constructed, in the case where, from any cause, the grate is fed with coal in too wet a condition through the feed hopper, the coal moves in jerks, accumulating far too much in the middle of the grate. In this improved apparatus, the excess of coal falls into the tube D, the lower end of which extends into a tank containing water, from which the coal can be easily removed by hand.



Wesselsky's Gas-Producer.

In order to facilitate the bringing of the cone into the necessary position (especially into a lower position), openings E are provided around the supporting ring, to allow the insertion of suitable tools for removing any obstruction that may exist, and thus prevent any interference with the downward movement of the cone which might be caused by masses of coal. In the same way, clinkers or slag accumulated between the fuel-supporting ring and the grate can be removed. The openings may be closed by shutters of bell-form or annular covers F, which dip at both ends into channels filled with water, sand, asbestos, or the like.

Carbonizing Coals for the Production of Illuminating and Heating Gases.

YOUNG, W., of Peebles, and GLOVER, S., of St. Helens.

No. 23,650; Nov. 17, 1905.

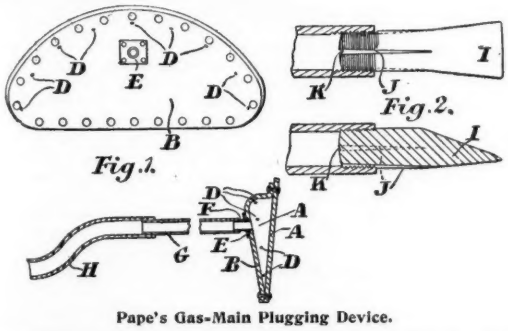
This invention forms the subject of an article in another column to-day.—p. 305.

Plugging Gas-Mains.

PAPE, A., of Berlin.

No. 16,028; July 16, 1906.

The patentee has designed his appliance to obviate the objection that, in the devices heretofore in use for plugging gas-mains, there are no means of ascertaining whether the branch pipe which it was intended to plug has been closed obsolutely tight; but in his invention, these inconveniences and drawbacks are said to be avoided, "without causing any difficulty of manipulation."



Pape's Gas-Main Plugging Device.

As shown, the main is provided with an opening through which is introduced the plugging or sealing disc C, with a tubular inflatable ring D surrounding it. Both disc and tubular ring are preferably made of rubber or other suitable flexible material. The tubular ring has a triangular section, arranged in such a manner that the broad base of the ring, when in the inflated condition, is forced against the walls of the pipe, presenting a "broad tightening surface at the walls." The tubular ring is connected to a metal tubing or nipple E corresponding to the diameter of the operating hole and closed air-tight. The operating hole may be made tight by a sleeve F displaceable upon the nipple, and locked in position by a bayonet joint. In the interior of E, another pipe G, with admission cock H, is arranged, which serves for inflating the tubular ring, and which opens out in the tubular ring. Besides, a controlling pipe I, surrounding the pipe G and tightly shut off from it and opening out into the gas-main to be plugged, reaches through the nipple E and up to about the middle of the disc C. This controlling pipe connects the branch pipe to be plugged with the outer atmosphere, in order to be able to ascertain whether or not there is any gas pressure in the pipe.

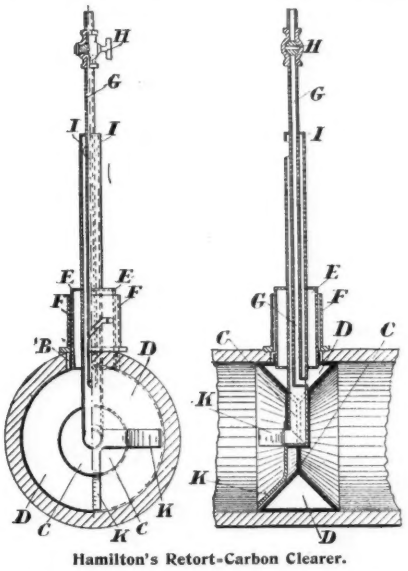
On the disc C, and preferably at the point of termination of the controlling pipe I, supports or abutments K are provided, which are bent so as to correspond to the shape of the tubular pipe D when in an inflated condition. They are intended to constitute a resistance for the tubular ring D, which is forced in the direction of the branch pipe, which is free from gas pressure, when in an inflated condition, so as to prevent any bulging out of the tubular ring (at the side opposite to the operating hole), which is likely to occur in the case of pipes of large diameter.

Water-Spraying Device for Gas-Retorts.

HAMILTON, R., of Motherwell, N.B.

No. 25,329; Dec. 6, 1905.

The object of this invention is to prevent the accumulation of carbon on the interior of retorts (each time the charge is withdrawn) by using an improved "claut" or drag, kept cool by water, and from which sprays of water issue and play on the carbon deposit, so that it contracts and can then be removed with ease. When the charge is being drawn by the claut, the carbon is also scraped off at the same time.



Hamilton's Retort-Carbon Clearer.

Fig. 1 is a back elevation and a vertical longitudinal section of the device with the handle removed. Fig. 2 is a part section and part plan, also a sectional elevation of an auxiliary device.

The device is made of two plates A and B riveted together. The plate A is the same size and shape as the usual claut; while the plate B is so shaped (as shown) that, when the two plates are riveted together, a water chamber or vessel is formed. Small holes D are made round the top and sides of the plate B, and a tubular metal handle G is secured to it by (say) a small plate E riveted to the plate B for the reception of the nipple F, and over which the rigid pipe G is screwed. Fitted on the end of the tubular handle is a flexible water-supply pipe H, provided with a controlling valve or cock.

The device (which is operated in the same manner as the ordinary clauts or drags) is used to rake out the carbonaceous deposit on the interior of the retort; the plate A acting as a rake or scraper so as to remove the carbon. It is said to possess great advantage over the ordinary clauts in so far as water sprays issue from the holes D communicating with the water-chamber and play on the carbon deposit, with the result that it contracts and can then be removed with the slightest touch of the claut.

The auxiliary device shown in fig. 2 is used for cleaning out corners. It consists of a metal chisel I screwed at one end and having longitudinal grooves J running from the screwed end for a certain distance down its length towards the cutting edge. These grooves are connected with one another by lateral grooves K across the screwed end of the chisel. To the screwed end is secured a tubular handle or pipe through which water is supplied to the grooves of the chisel.

APPLICATIONS FOR LETTERS PATENT.

22,758.—VERGES, O., "Packing mantles." Oct. 15.

22,918.—POTTER, W. G., "Valves for gas and water." Oct. 17.

22,922.—HAIGH, H. R., "Lighting railway carriages with compressed gas." Oct. 17.

23,000.—HATTON, J., and SWAN, H., "Inverted lamp." Oct. 17.

23,067.—CLAUGHTON, T., "Gas-producer." Oct. 18.

23,080.—WILLIS, P. R. J., "Gas-generator." A communication from J. Sales. Oct. 18.

23,092.—FOX, F. L., "Anti-vibrators." Oct. 18.

23,257.—POTTER, W. G., "Valves for gas and water." Oct. 20.

23,307.—SMITH, G. B., and CHURCH, S., "Wet gas-meters." Oct. 20.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

The Tar Question.

SIR,—I am sorry I misunderstood Mr. Hardie, and glad to find he is in sympathy with the desire to improve the market for tar. I thought, however, and still think, that the paragraph quoted from his address in my letter of the 12th inst., where he said "the benefits accruing are practically *nil*," might lead gas people to conclude that it would not be worth while to push the sale of tar for road making.

As to maintaining two prices, there is no difficulty—in fact, tar has always been sold at two or more prices. Gas companies sell what they can locally, and advertise for tenders for their "surplus," for which hitherto the lowest price has been obtained—about its fuel value. Years ago much was used as fuel for heating the retorts, in order to reduce the surplus and get a better price for it. The surplus needs reducing now more than ever. If we reduced it to a little less than the demand, there would be competition for it, and the price would rise. Therefore, sell as much as possible at a low price for purposes other than distilling, and thereby obtain a higher price for the remainder.

Reigate, Oct. 27, 1906. GEORGE LIVESEY.

Special Purposes Fund of the Institution of Gas Engineers.

SIR,—The Council desire, through the medium of your columns, to announce that, in response to the circular appealing for subscriptions to the above fund, the list, made up to the present date, amounts to £581 13s., from 145 undertakings, comprising companies, corporations, urban district councils, and privately owned; the majority of the subscriptions being based on the scale suggested in the circular—viz, 6d. per million cubic feet of gas made annually.

WALTER T. DUNN,
39, *Victoria Street, S.W., Oct. 24, 1906.* Secretary.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, Oct. 26.

(*Before Lords Justices* FLETCHER MOULTON *and* BUCKLEY.)

Hastings Tramway Company v. Hastings and St. Leonards Gas Company.

This was an appeal by the plaintiffs from the decision of Mr. Justice Bargrave Deane, sitting as Vacation Judge, on the 3rd inst., dismissing the plaintiffs' motion to restrain the defendants from proceeding with an arbitration under the Tramways Act, 1870 (see *ante*, p. 112).

Mr. ROSKILL, K.C., appeared with Mr. ATTWATER for the appellants; Mr. UPJOHN, K.C., and Mr. BRAMWELL DAVIS represented the respondents.

Mr. ROSKILL contended very strongly that, owing to the Gas Company not having given a counter-notice to the plaintiffs within seven days after receiving their notice and plans, on the 1st of June, they were debarred from going to arbitration.

Counsel for the respondents were not called upon.

Lord Justice FLETCHER MOULTON, in giving judgment, said there was only one point involved in the appeal, and that was a very simple one. Under section 30 of the Tramways Act of 1870, it was provided that where a tramway was to be constructed along streets in which gas or water companies had laid mains, the tramway company, before doing any work, were to give to the owners of the mains seven days' notice, accompanied by a plan showing the details of the works proposed. The owners of the mains then had the right to give a counter-notice that they objected to the proposed works if they interfered with the mains in a way which they considered unreasonable or improper. Regulations of this kind were necessary, not only for gas and water companies, but also in the case of sewers; and in another section, relating to sewers, there was a specific provision that the counter-notice must be given within a certain number of days. In the case of gas and water mains, there was no provision as to when the counter-notice should be sent. The only question here involved was whether they ought to read into the section relating to gas-mains a provision that the counter-notice must be given within the seven days, the period of the notice which the Tramway Company had to give. He saw no reason or justification for reading such a limitation in section 30; and the fact that where it was intended to exist, as in the case of the sewers, it was specifically mentioned, strengthened his mind in this respect. He was therefore of opinion that the Gas Company were entitled to go to arbitration as to the propriety of the proposed works, and that the appeal should be dismissed with costs.

Lord Justice BUCKLEY concurred. He said an argument had been put forward that because, under section 27, penalties were imposed if the promoters failed to comply with certain provisions as to time for the completion of the works, they ought to infer a limit of time for giving the counter-notice. But he failed to see the force of the argument. The penalty was imposed if the promoters did not do their duty. If they were prevented from completing their works by a notice properly given under the statute, the tribunal which imposed the penalty could, of course, meet the difficulty by making it a merely nominal one, or by not imposing it at all, because the promoters had not really failed in their duty.

Mr. BRAMWELL DAVIS said his friend agreed that the appeal should be treated as the trial of the action. The order, therefore, would be that the action be dismissed with costs, including the costs of the motion and the appeal.

Mr. ROSKILL said he quite agreed to this.

Claim under the Workmen's Compensation Act.

A case was heard, a few days ago, at the Carmarthen County Court, in which Mrs. Elizabeth Basham claimed £300, under the Workmen's Compensation Act, from the Carmarthen Gas Company, for damages sustained through the death of her husband from gas poisoning. Mr. Llewelyn Williams, who appeared for the applicant, admitted that the point at which the accident happened was within 9 feet of the boundary wall of the gas-works; but it was a question whether this was near enough to be described as "about" the factory, in the terms of the Act. Counsel argued that the fact of the accident having occurred so near to the factory wall brought it into physical contiguity. The Judge, however, held to the contrary, and found for the defendants.

Liability for a Water Supply.

At the Barnstaple County Court last Tuesday, his Honour Judge Beresford heard a case which had been adjourned from a previous sitting, in which the Ilfracombe Urban District Council were plaintiffs and Henry Watts, sen., a lodging-house keeper of Morthoe, was defendant. The claim was for £1 15s. for water-rate due under a contract. Mr. Weatherley, who appeared for the plaintiffs, explained that at the request of the inhabitants of Morthoe and Woolacombe the Ilfracombe Council extended their water supply to those places. A number of persons signed contracts to take the water; and among them was the defendant. On the first half-year's rate being demanded, defendant did not pay; but on being sued, he paid into Court. For the defence, Mr. Bosson alleged that Watts was induced to sign the contract by the representation that it was a petition on the part of the parish. He had an ample amount of water for his own use, and had not taken the Council's supply. Defendant gave evidence to the effect that he signed the paper in the belief that it was a petition, and that he saw nothing of the printed form and heading. This allegation was strongly denied by the members of the Morthoe Parish Council who canvassed for signatures. His Honour held that there was no ground for suggesting that defendant's signature was obtained by a trick, and said the case was practically undefended. He gave judgment for the plaintiffs, with costs on the higher scale.

Coventry Corporation and the Supply of Fittings.

It may be remembered that the Gas Committee of the Coventry Corporation received a deputation from the Gas and Electrical Engineers' Association and the Ironmongers' and Gas-Fitters' Association on the question of the Gas Department supplying and fixing gas-fittings. The result was that the Committee reported to the City Council that they could not see their way to make any alteration in the present practice. The first-named Association thereupon memorialized the Council direct; and a further communication was before them last Tuesday. It was pointed out therein that the gas-fitters of the city, comprising a large number of ratepayers, carrying on an important business, and paying a considerable amount of money in wages weekly, had suffered to a large extent through the competition of the Committee, more especially since they had undertaken all kinds of gas-fitting in addition to the laying of service-pipes and fixing stoves and meters, to which their work was previously limited. The memorialists contended that there was not any necessity whatever for the Gas Committee to do gas-fitting of any description, beyond fixing meters. They pointed out that this trade had for many years been carried out in a thoroughly satisfactory manner by the local tradesmen, who were, they said, quite capable of doing it as satisfactorily to-day as they had done in the past. The Council referred the communication to the Gas Committee for their consideration.

Sales of Gas Stock.—Last Thursday, Messrs. Grimley and Son sold at the Grand Hotel, Redditch, £10,000 of 5 per cent. preference stock of the Redditch Gas Company. It was put up in £100 lots, which fetched from £104 10s. to £106 each; the total amount realized by the sale being £10,468 5s. The recent issue of £7000 of the 5 per cent. stock of the Southampton Gas Company at £112 per £100 resulted in applications being received for £12,630.

New Joint-Stock Companies.—The Globe Gas-Engine Company, Limited, was registered in Edinburgh last week, to acquire and carry on the engineering works of Messrs. Pollock, Whyte, and Weddell, Globe Gas-Engine Works, Johnstone. The capital is £30,000, in £1 shares, divided into 15,000 6 per cent. preference, and a like number of ordinary shares. The Guernsey Water Company was registered on the 20th inst., with a capital of £50,000, in £1 shares, to acquire the business of the Guernsey Water Company, Limited. There is no initial public issue.

Awards at the Milan Exhibition.—Those of our readers who visited the Milan Exhibition will doubtless remember that the Richmond Gas Stove and Meter Company had an important exhibit in the English Hygiene Section. Information has reached them that they have been awarded a Diploma of Honour and three gold medals for excellence in their manufactures, particularly the hotel and hospital apparatus, domestic cookers, gas-fires, and gas-meters. The Glenboig Union Fire-Clay Company, Limited, have received a Diploma of Honour and two gold medals. The exhibits of both of these firms were noticed in a short account of the gas exhibits which appeared in the "JOURNAL" for the 18th ult. in connection with the meeting of the Italian Gas Society in Milan.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Ninth Annual General Meeting of the Association was held yesterday, at the Westminster Palace Hotel—Mr. H. E. JONES in the chair.

The attendance-book registered as follows: Mr. H. E. Jones, Chairman; Sir George Livesey, Vice-Chairman; Messrs. Frank Bush, South Metropolitan Gas Company; W. R. Phillips, Hitchin; William King, Liverpool; S. Y. Shoubridge, South Suburban Gas Company; A. G. Snelgrove, West Ham; George Clarry, Cardiff; Thomas Berridge, Leamington; R. O. Paterson, Cheltenham; E. W. H. Eady, Southampton; Chas. E. Botley, Hastings; W. Belton, Shrewsbury; C. W. Braine, Wandsworth; W. Mann, Brentford; G. T. Eunson, Northampton; R. P. Kitson, Torquay; R. Bruce Anderson, Waterford; A Canning Williams, Reading; T. H. Hazell, Newport (Mon.); Charles M. Ohren, South Suburban Gas Company; Stanley Sherrard, Kingston-on-Thames; and Alderman Hart, Canterbury.

The SECRETARY (Mr. Fred. E. Cooper) read the minutes of the last annual meeting, which were confirmed.

ANNUAL REPORT.

The SECRETARY then read the annual report on the proceedings of the Association, together with the balance-sheet. The report was as follows:—

The Committee have pleasure in presenting their report of the proceedings of the Association during the past year.

The Committee again directed the attention of all gas companies affected by Bills containing electrical provisions and Electric Lighting Provisional Orders promoted by local authorities to the advisability of their taking the necessary steps to ensure the insertion therein of the Northumberland clause.

As in previous sessions, the Committee have closely watched the proceedings of Parliament, with a view of preventing the enactment of Bills inimical to the interests of gas companies. Several Bills which in one way or another affected gas companies were introduced; but none of them passed into law.

In accordance with the motion of Sir George Livesey, that the meeting request the Committee to take into consideration the advisability of promoting a Bill in the then next session of Parliament for the relief of companies then under the sulphur clauses from the obligation to purify gas from sulphur compounds, which was unanimously carried at the last annual general meeting, the Committee took the initial steps for the promotion of a Joint Bill for the relief of gas companies from sulphur clauses, and resolved to contribute out of the Association's funds the sum of £100 towards the cost of promoting such Bill.

The conduct of the matter was referred to a Sub-Committee of the Association, and ultimately, under their direction, a Bill, called "The Gas Companies (Removal of Sulphur Restrictions) Bill," was promoted by the following Gas Companies who were subject to the sulphur clauses: British Gaslight Company, Limited (in respect of three stations), Cambridge University and Town Gaslight Company, Harrow and Stanmore Gas Company, Hastings and St. Leonards Gas Company, Hampton Court Gas Company, Ipswich Gas Company, Newcastle-upon-Tyne and Gateshead Gas Company, Reading Gas Company, Richmond Gas Company, Shrewsbury Gaslight Company, Tunbridge Wells Gas Company, Walker and Wallsend Union Gas Company, Wandsworth and Putney Gaslight and Coke Company, and Wolverhampton Gas Company.

The Bill was at first somewhat heavily opposed by various Local Authorities who were affected thereby; but ultimately all opposition was withdrawn excepting that of the Corporation of Newcastle, who appeared in Committee in opposition to the Bill, so far as it affected the Newcastle-upon-Tyne and Gateshead Gas Company. The opposition was unsuccessful, and was not continued in the second House; and the Bill duly passed into law.

The total cost of promoting the Bill was £2119 1s. 7d., which, after allowing for the contributions of £100 and £21 made by the Gas Companies' Protection Association and the Southampton Gaslight and Coke Company respectively, represents a contribution by each Company towards the cost of a sum equal to about 4s. 6d. per million of its annual make of gas.

The Committee understand that some of the gas companies who are still under the sulphur clauses intend promoting a similar Bill in the ensuing session of Parliament; and they suggest that other companies subject to the same restrictions might find this a good opportunity for obtaining relief therefrom.

The Sub-Committee for General Purposes considered a communication from the London Chamber of Commerce with reference to the suggested formation of a Federation of Manufacturers, inviting the Association to be represented at the preliminary meeting; and, at their request, the Chairman attended the meeting. The formation of a Federated Association of Manufacturers was decided upon, and the question of this Association joining the same was brought before the Committee at their meeting to-day, when it was resolved to refer the matter to the Sub-Committee for General Purposes to consider and report.

The Home Secretary has issued regulations for the use of locomotives and waggons on lines and sidings in, or used in connection with, premises under the Factory and Workshop Act, 1901, which, of course, affect gas companies, and are required to be kept on the premises to which they relate. The Committee have directed the attention of the members of the Association to the matter, and have forwarded to each Company a copy of the regulations in question.

The Association continues to prove itself useful to gas companies by giving advice on various matters relating to the conduct of gas undertakings. The following are some of the principal points upon which the Secretary has been consulted during the past year: Right of Clerk of Peace to charge a fee on the filing of gas companies' accounts. Disputes with local authorities as to reinstatement of roads. Right of a councillor, being a shareholder in a gas company, to take part in discussion on public lighting. Consumer's liability for amount of money stolen from a slot meter. Deduction in income-tax return for depreciation of gasholders, and for wear and tear of machinery, &c. Liability of consumer for damage done to meter. Pollution of streams by gas companies. Expediency of gas companies opposing Electric Lighting Orders promoted by local authorities. By whom increased expense caused to a gas company in laying, &c., mains by reason of the construction of tramways should be borne. Advice as to protection necessary for gas companies in various Bills and Orders. Mode in which companies' accounts should deal with the value of lamp-pillars removed from roadways where electric lighting had been installed. Supply of gas for public lighting. Liability of gas company to conform to Building Acts and local bye-laws. Legality of gas company borrowing money from bankers by way of temporary loan. Various questions arising on the issue of new capital. Shareholders' right to inspect companies' books. Power of gas company to use surplus revenue for capital purposes. Mode in which a gas company should authorize a bailiff to distrain for rent. Various points arising out of the service on a gas company of a distringas notice.

The present number of members is 96. There were six new members last year and seven withdrawals. One of the withdrawals was in consequence of the acquisition of the gas undertaking by the Local Authority, and the consequent liquidation of the Company.

The Committee once more desire to bring before gas companies generally the advantage conferred upon them by membership of the Association.

In pursuance of No. 9 of the Association's rules, the following gentlemen retire from the Committee: Mr. Thornton Andrews (Swansea Gas Company), Mr. C. E. Botley (Hastings and St. Leonard's Gas Company), Mr. H. B. Chamberlain (British Gaslight Company), Mr. George Clarry (Cardiff Gaslight and Coke Company), Mr. J. W. Helps (Croydon Gas Company), Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company—all of whom, with the exception of Mr. J. W. Helps, offer themselves for re-election. There is also a vacancy on the Committee caused by the death of Colonel Sir William Makins, Bart. (Gaslight and Coke Company).

The Chairman and Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company) have intimated their intention to propose Mr. Corbet Woodall (Governor of the Gaslight and Coke Company) as a member of the Committee; and Mr. A. Canning Williams intends proposing Mr. Douglas H. Helps (Reading Gas Company) as a member of the Committee.

THE LATE SIR WILLIAM MAKINS.

The CHAIRMAN said it was his duty to ask the members to receive and approve the report and balance-sheet. He could not do so, however, with the echo of the closing words of the minutes of the last meeting ringing in his ears, without opening his remarks by an expression of the profound personal regret with which they must all have received intelligence of the death of Colonel Sir William Makins, one of their members. In pursuance of the resolution passed at the last meeting, he (the Chairman) wrote him a letter; but he had then no idea that he was mortally ill, as he was. He (Mr. Jones) received a charming letter in reply, couched in the most friendly and hopeful terms; and he really hoped from this that Sir William was recovering. He was throughout a member of the Association; and it would be remembered how punctually he attended their meetings, and with what modesty he always declined to take the chair. When Sir George Livesey, their first President, retired, he (Mr. Jones) personally begged Sir William to take the chair, as he felt it only right that the representative of so enormous an undertaking as that of which Sir William was the head, should also be at the head of the Association; and if the head of the same large Company was now elected to the Committee, he sincerely hoped he might be induced to take the chair, which was only the due of the representative of the largest Gas Company. However, he (the Chairman) was sure the members would like to express at this first meeting, bearing in mind the letter that they authorized him to send to Sir William at the last meeting, their view of the loss the whole gas world suffered when that amiable and influential gentleman was taken from among them. He took it the members would like to have their sense of this loss entered upon the minutes. Might he take it that this was their view? [The members assented.]

THE REMOVAL OF SULPHUR RESTRICTION CLAUSE.

Coming to the business before the meeting, happily—or perhaps he ought to say unhappily, because "happy was the nation that had no history"—the past year had been a very eventful one. If ever proof was demanded as to the justification of their existence, he thought they furnished that proof signally last year, by initiating, at the instance of their Vice-President, Sir George Livesey, a Bill to relieve the Companies outside of London of the onerous restrictions that were then bearing upon them. No less than fourteen Companies supported that Bill, which was carried through; and it gave relief to all the Companies concerned. [He read the list given in the report.]

Mr. EADY: The Southampton Company also got through.

The CHAIRMAN (proceeding) said that was so; but they promoted a separate Bill. Of course, this was a twice-fought battle. The merits of the case had been disposed of, thanks to the untiring and persistent energy of Sir George Livesey over three or four sessions of Parliament; so that as to the principle of the thing, there was not very much to be feared. But when they got into the Committee-room, they found they had a doughty opponent in the shape of the Newcastle-upon-Tyne Corporation; and inasmuch as all the rest of the opposition had been withdrawn, it was then felt it would have been a desirable thing if Newcastle had dropped out. Very fortunately for the annals and interests of the gas industry in the future, they decided that they would fight the matter, and not let the others go through alone. There was a great fight. Sir George was called upon to give evidence for the promoters; and they were in attendance at the Committee-rooms for some days. The result was the triumphant passing of the Bill, and the reassertion of the principle that dominated the Chairman and Committee who sat on the London Gas Bill; and it was the same Chairman they had on the Association's Bill. This Bill had not been an expensive thing for the Association. They agreed to subscribe the sum of £100 towards the expenses; and if the members would look at the statement of income and expenditure, it would be seen that this modest sum was all that was put down.

A PROPOSED FEDERATION OF MANUFACTURERS.

Having dealt with the most important part of the report, he would just glance at the other portions, and then refer to the accounts. They had been approached by the London Chamber of Commerce, as would be seen from the report; and the Committee of the Association were now considering the question of a member to join them as representing the interests of the manufacture of gas. It was not quite clear to the Committee at present how far an Association of this kind, dealing with matters of legislation and not of manufacture, could give strength to that Committee. However, they had referred the question to a Special

Committee; and they were going to further consider it. As far as possible, they should try to avail themselves of this invitation to supplement that body.

A FURTHER JOINT BILL.

Reverting to the passing of the Removal of the Sulphur Restrictions Bill of this session, he did hope the outstanding Companies who were still under the effete legislation would not allow the coming session to pass without clinching the nail that had been driven home so well in the past. Up to now, they had only, he regretted to say, heard of four Companies who were thinking of the Bill at all. There must be at least twenty remaining; and one element which would tend towards success would be the cohesion of the remaining number. And it ought not to need much pressure to bring about that cohesion, when they realized how successful, and comparatively easily successful, the last Bill was. It was quite true that in some of the Companies the enactment had been lying dormant. The Local Authorities had been cleverer than the Departmental Committee of the Board of Trade, because they had settled from the very first that restriction was undesirable; and they had not acted upon it. This ruled in a good many places. But a councillor might get up at any moment, and call the attention of the authority to the powers they possessed; and if he were aided and abetted, he might bring about the infliction of the system of testing and penalty. The companies would be unwise if they allowed the matter to remain in doubt, which the Association had shown in other cases should be made a matter of certainty. Personally, he did not think the Association could move with such a "lame and impotent" following as four companies would be; and they ought to have the number greatly reinforced out of the balance. The companies should remember that the expense falling upon each by all dealing with the matter was very much less than when only a small number took part—that was to say, the more companies there were under the flag, the less would be the proportion of individual cost when the battle was fought.

RAILWAY SIDINGS INQUIRY.

With regard to other portions of the report, in the inquiry into the use of locomotives and waggons on works, he thought the case of the gas industry was well met by the evidence put before the Commissioner (Mr. Chester Jones). The Association called the attention of the companies in the first instance to the inquiry, and pointed out the necessity of having the facts put properly before the Commissioner. He thought the members would agree that the report of Mr. Chester Jones was, on the whole, a very fair one; and the regulations that were issued were nothing like so onerous or difficult as they threatened at one time to be.

MISCELLANEOUS MATTERS.

It would be seen, from a long statement in the report, what an enormous number of delicate points their Secretary had advised several gas companies upon. He (the Chairman) could only repeat the pious hope he expressed more than a year ago, that—if their Secretary could only settle these questions that he answered, the expense was less, and he was more successful than most counsel and barristers-at-law—the number of their members ought to increase considerably. But with regard to the number of the members, there was a letter before the Committee from one company representing that the subscription of two guineas was rather heavy upon a concern of their size; and the Special Committee were going to look into the matter. His own view was they would get a larger number of contributors immediately if the smaller scale of company were considered and admitted at a lower figure. They would have to start at a lower dividing line than the one that now existed.

A MEMBER: What is it now?

The SECRETARY: £10,000 of capital.

The CHAIRMAN said his own feeling was that any company making less than 20 million cubic feet of gas per annum ought to come in at a lower rate.

The SECRETARY: The make of the Company complaining is about 44 millions.

The CHAIRMAN remarked that there were a countless number of small undertakings that would like to join; but they did not see their way to find the two guineas.

RATING AND THE HYPOTHETICAL TENANT'S PROPERTY.

The Secretary did not appear to have been troubled on the question of rating disputes; but this subject he (the Chairman) supposed the members all kept their eyes upon. It would have been noticed in recent cases that the rating authorities, who had been carefully riding the hypothetical tenant to death ever since the Lea case—now that he possessed a large amount of property in the way of stoves, coin-meters, and fittings, and that the application of the principle did not answer their purpose—were all trying to get away from him. But he suited their purpose for so many years, when dividends were high and the hypothetical tenant's capital was very small, that gas companies could not allow the rating authorities to slip off in this fashion; and if they did not like the application of the law under the present state of things, they must find a way out of it.

THE BALANCE-SHEET.

With regard to the balance-sheet, there was an absence in it of any particulars of the Association's assets. This they were going to give in future accounts, so as to show the amount of property held. There was an indirect reference to it in the receipts, where it was shown that the interest on £1100 of 2½ per cent. consolidated stock was £26 2s. 8d. The present financial condition roughly amounted to this—that they had in hand £372; and they had also £177 more stock than last year, or £549 against the £415 they started with, which was practically £134 gain. Beyond this they had the extraordinary payment of £100 expenses in connection with the Joint Bill, which payment would not occur again. Therefore their position might be roughly taken to be that they had made a profit in the year, or increased their assets in the year, by £234.

Mr. W. BELTON (Shrewsbury) seconded the motion.

GET AS MUCH REPRESENTATION FOR THE GAS INDUSTRY AS POSSIBLE.

Sir GEORGE LIVESEY referred to the representation of the Association on the Chamber of Commerce Committee. He thought it extremely important that the gas industry should take every opportunity of being represented everywhere, because the amount of ignorance and prejudice existing in regard to gas was so great that they could not afford to lose any opportunities of protecting themselves. As to the reduced subscription, he was not at all sure whether it would not be better to say: "This Association is so valuable and so useful to gas companies, that the subscription will be doubled, not reduced." He did not like the idea of playing down to the ignorance and meanness of a lot of people. The little companies gave much more trouble than anyone else. They wanted to get law cheap; and if the subscription was reduced to one guinea, they would trouble their Secretary more than all the other companies put together. Personally, he would not do it; but it was for the Committee to decide. He did not believe that "playing down" was a good policy.

ELECTION OF MR. CORBET WOODALL AND OTHER MEMBERS TO THE COMMITTEE.

The CHAIRMAN said that, in the exercise of his privilege as Chairman, he begged to move that Mr. Corbet Woodall be elected a member of the Committee. He had asked Mr. Woodall's permission to do this, and he had signified his assent.

Mr. R. O. PATERSON (Cheltenham) seconded the motion; remarking that it was most important that the Governor of the largest gas undertaking should be a member of the Committee.

The motion was very heartily passed.

The CHAIRMAN added that he hoped when Mr. Woodall came on to the Committee they would get him to take the chair. It was only right—Sir George Livesey having held the chairmanship so long, and he (Mr. Jones) since his retirement—that Mr. Corbet Woodall, on coming among them, should occupy the position. The Association would certainly gain in every way if they could induce him to take the chair. Continuing, the Chairman moved the re-election of the retiring members of the Committee, excepting Mr. J. W. Helps, who did not offer himself again.

Alderman HART seconded the motion, and it was unanimously carried.

Mr. A. CANNING WILLIAMS proposed the election of Mr. D. H. Helps as a member of the Committee. Mr. Helps being a brother of Mr. J. W. Helps was, he said, an additional reason why he should be appointed.

The CHAIRMAN seconded the motion; observing that they could not afford to lose one "help" without getting another. (Laughter.) They all knew Mr. Douglas Helps very well. He was a capable and accomplished Engineer; and they would be glad to see him among them.

The motion was cordially passed.

COMPLETING THE WORK OF REMOVING THE SULPHUR RESTRICTIONS.

Sir GEORGE LIVESEY said he had a resolution to submit to the meeting with the object of completing the work that was taken in hand and successfully carried through so far last session—that was, the work of relieving gas companies from the sulphur restrictions. He submitted the resolution to the Committee, and it had been put into this shape:

> That the Gas Companies' Protection Association do inform all gas companies still subject to the sulphur restrictions that, following the precedent of last year, the Association is willing to again take the initial step in the direction of a Bill for the relief of such companies from such restrictions, provided that the companies joining in the promotion of the Bill defray the cost thereof proportionally to their annual make of gas.

Dealing with the last paragraph first, this meant that the companies concerned were to defray the whole of the costs. It was quite enough for the Association to have agreed to pay £100 in the first instance. These companies did not choose to avail themselves of the opportunity then offered to them. And so, whatever the cost might be, if they agreed to unite themselves under the auspices of the Association, they must pay the whole expense. It would be wrong for the Association to pay anything. Regarding the question as to what the Bill would cost. Last time it was £2119; but if this next one were an Unopposed Bill, as it might be expected it would be, it would cost considerably less—perhaps not more than one-third. There was a difficulty. He was calling on the official of a company a few days previously. They were under the sulphur restrictions; and he learned that the Chairman had had this matter brought before him, but he was rather afraid an expense of £50 or £60 would be a very serious matter. These Directors of gas companies knew nothing about the business. They could not understand that the money did not come out of their or the shareholders' pockets, and that it would not be felt at all. They boggled over a paltry £50 or £60. Then the Engineer of the Company was a man addicted to the use of lime. He believed he told his Chairman that if they obtained relief from the restrictions, he should continue to use lime. But he was under the delusion that he was reducing his sulphur to 11 grains. He (Sir George) was informed how he used his lime; and, certainly, he was the cleverest man in England, if he could by this means get down to 11 grains. And the gas was not tested by the proper sulphur test. He (Sir George) thought it should be made clear to these companies that if the Association adopted the resolution before the meeting, it was the last chance they would have, for he personally would certainly not propose, and he did not suppose anyone else would, that the Association should again take a single step to help them. But what he hoped now was that they would see the removal of these restrictions altogether.

Mr. C. E. BOTLEY (Hastings) seconded the motion; remarking that those companies who had not been relieved of the sulphur restrictions could not appreciate the benefit of it. After some experience—they started discontinuing lime purification at once—they had no complaints at all from the consumers; and there was really no appreciable effect on the gas. If the companies would all come into line, it would be better for the industry.

Sir GEORGE LIVESEY: There will be no opposition. Newcastle settled that.

The CHAIRMAN: If the twenty gas companies came in, probably it would not cost them more than £30 or £40 each. Perhaps the Technical Press would give them a hint.

Sir GEORGE LIVESEY: That has already been done [see "JOURNAL" for Oct. 23, pp. 226, 253]; but perhaps another hint will be given.

Mr. W. BELTON (Shrewsbury) said his Directors desired him to express at this meeting their high appreciation of the services of the Association in connection with the Sulphur Bill of last session.

The CHAIRMAN remarked that the Association were extremely grateful for this expression of courtesy.

DOUBTFUL COMPANIES.

Mr. R. BRUCE ANDERSON called attention to recent company promotions, and spoke of the depreciation they brought upon the value of gas stocks. He thought this was a matter the Association might take up. One way of assisting to effect a cure would be to get the removal of the names of men who lent their names and qualifications to these companies from the Associations to which they might belong in connection with the gas industry.

REPRESENTATION ON LOCAL AUTHORITIES.

Alderman HART (Canterbury) suggested that efforts should also be made to get representation of gas companies on local councils. They were large payers of rates.

Mr. W. R. PHILLIPS (Luton) said he had been nine years on his Council, and he was always looked upon with a jealous eye. When anything came up in regard to expenditure, especially in connection with the repair of roads or lighting, his position was unenviable. After nine years, he determined that he would not act again.

There was a little discussion on the suggestion; and it ended by the matter being left to the consideration of the Committee.

On the motion of Mr. A. G. SNELGROVE, seconded by Sir GEORGE LIVESEY, a hearty vote of thanks was passed to the Chairman, whose acknowledgment ended the proceedings.

NOTTINGHAM GAS CONTROVERSY.

The attempts which are being made by certain of the candidates for municipal honours at Nottingham to divert attention from the main issues underlying the controversy as to the management of the Corporation gas undertaking, are becoming supremely amusing. But, unfortunately, the fun is not of an innocent character.

In the endeavour to bluff the unsophisticated ratepayer by a travesty of the facts, it has been made to appear by one of the responsible speakers who led the attack upon the Gas Engineer (Mr. J. H. Brown), that it was in order, figuratively speaking, to save his face that the recent prolonged inquiry was conducted with closed doors. Absolutely nothing could be at greater variance with the truth. If the Engineer had anything to fear, one might well imagine his gratitude that the evidence was given in private. But, as a matter of fact, he from the very outset courted—nay, indeed, appealed for—the fullest inquiry in as public a manner as could be made reasonably possible. To those who know the real facts, it is nothing short of deliberate misrepresentation to say that the contrary is the case. Yet rubbishy talk on this and other subsidiary points in regard to the question has been forthcoming in an unintermittent stream at the ward meetings held during the past week. One notable factor, however, in the situation is that the late Chairman of the Gas Committee (Mr. E. Harlow) has not participated in the wordy warfare. If he cared to do so, he could tell exactly what Mr. Brown stated to the Committee; and there is such a laudable desire being manifested in Nottingham at this juncture to know the whole of the circumstances, that it seems a waste of a golden opportunity that Mr. Harlow does not gratify the public curiosity. Meanwhile, it is not uninteresting to observe that Major J. Ashworth, the Acting-Chairman of the Gas Committee, who took up the position when Mr. Harlow gave up the reins, has been returned unopposed for Castle Ward—one of the most influential residential districts in the town, embracing the valuable property in the Park, the estate of the Duke of Newcastle. The personal popularity of Major Ashworth would probably have proved sufficient, as on preceding occasions, to secure his re-election in the event of a contest; but the fact that the Conservative Party in the town allowed him the privilege of a walk-over was not devoid of connection with the impartial and fair-minded attitude which he has all along maintained in reference to the gas controversy. There were expectations at one time of a contest in Brixtowe Ward, where the chief gas-works are situate, and where of necessity, by reason of the large percentage of gas workers resident in the district, the matters in dispute as to the management must have occupied an all-important place in the electoral programme. But Mr. J. G. Hancock, the miners' agent, has been returned unopposed.

In the neighbouring ward, however—that of St. Albans—as in the ten other districts of the city in which elections are pending, almost the sole topic of platform talk is as to the gas. And it is significant to notice that the responsible official, who was originally one of the most maligned men in the city, is seldom now referred to in other than mildly appreciative, if not entirely complimentary, terms. The wire-pullers who have attempted to make party capital out of the alleged maladministration of matters connected with the gas undertaking have been defeated by the very Chadband like protestations of their own disinterestedness. The ratepayers appear for the most part, however, not to be in the humour to be further gulled.

If there is nothing to fear, let the evidence given before the Special Committee of Investigation be made public. Such is the argument of the ordinary stay-at-home ratepayer who has no predilection for the clap-trap of public meetings, and who is content to judge of the situation unprejudiced by party bias. People are growing suspicious about the constant bogey which is being raised as to the publication bringing within its train possible consequences upon the score of libel. Mr. Brown, metaphorically speaking, was placed in the pillory by a number of men who, to put it bluntly, suggested that he did not know his business as an Engineer. He has given his answer, and that in such a convincing manner that the Committee could come to no other than a unanimous decision in his favour. Yet the grounds upon which his complete exculpation is based are not to be divulged. It is presumably because he told the Committee some very unpalatable truths, not about one, but about several individuals who were endeavouring to effect his professional ostracism by means of political-cum-Trades Union tyranny. The feeling is growing in Nottingham that the only real solution of the difficulty will be something in the nature of a Government inquiry into the whole of the circumstances. The present *impasse* constitutes a reflection upon the wholesomeness of local administrative arrangements in regard to the chief trading concern of the Corporation.

Sir J. T. M'Craith, the leader of the Conservative Party in the Council, naturally speaks with authority on the question as one of the members of the Investigation Committee. As to the necessity for further publicity, he has on more than one occasion expressed his thorough agreement. He has pointed out that the Investigation Committee did not exhaust the possible scope of inquiry, and that it is still open for others to pursue the matter. To say that the subject is not to be revived, because the Committee agreed upon the terms of the report presented to the Council, is, in Sir John's view, an absurdity. Dr. Milner, who, in the recent debate in the Council Chamber, reminded members of the Corporation of the fact that in the present Engineer they had a man who had won the "blue riband" of his profession, has directed attention to one of the primary causes of the whole difficulty—the interval which elapsed between the death of the former Engineer (Mr. W. R. Chester), and the appointment of a successor to take the control of the Nottingham Gas-Works; and what Dr. Milner has not told the local public is of even greater significance. There was supposed to be a very well-organized concern, which, when submitted to the test, was found lacking in essential details, and in a state which represented gravity of danger. The new Engineer was confronted with the great task of bringing into efficiency works which, under a complaisant Committee, had been allowed more or less to drift. Drastic remedies were inevitable. Mr. Brown's apparent offence is that he detected the weak points too quickly, and advocated a means which might, if followed, have brought about efficiency with economical working. The first phase in the hostility was represented by *soi-disant* plumbers, who manœuvred the opposition to the newcomer with all the possible Trades Union influence which could be brought to bear. They vituperated at meetings, and found ready access to the columns of the local Press to suggest that recommendations in the interest of the gas undertaking were based upon imperfect knowledge upon the part of the Engineer. And yet many of these self-appointed critics might not, if their lives depended upon it, have been able to prove their ability (may the old-fashioned phraseology be permitted?) to "wipe" a joint.

Dr. Milner has again, in connection with the Nottingham municipal elections, been referring to the gas question. Speaking at a meeting on Friday, he said he was a member of the Gas Committee; and he was not afraid of his conduct in connection with it.

Going at length into the subject, he remarked—according to the report in the "Nottingham Express"—that he had made certain statements at his adoption meeting (*ante*, p. 259) which he perhaps might add to. One was that he had traced the source of the gas trouble to something like five years ago, when the late Engineer (Mr. W. R. Chester) died. For nine months he thought that the concern was without a Gas Engineer. He wanted them to realize—taking his own profession for example—what would happen if he were to go away for nine months, and leave his business to his dispenser. What would become of his business? That was where the trouble began. There were two parts of the works. One was purely the engineering and distributing portion, and the other the commercial part. The commercial part of the gas undertaking during those nine months was managed as well as it was before. He said this out of justice to Mr. Roe, the Chief Clerk, who had charge. As a consequence of the late Manager's absence, the works themselves, however, got into a very badstate, and were in that condition when the present Manager came. Though it had been a long time coming, the gas improved practically every week or month; but considering the amount of friction that had existed during that time, he was not surprised that the improvement had taken so long, He was accused also of sitting on the Gas Committee without raising his voice. But five years ago he moved the appointment of both an Engineer and a Manager; and he was laughed at for it. Now the Special Investigation Committee said that it was necessary. Some little while ago they had introduced on to the Gas Committee two gentlemen, one of whom, before he had been on the Committee, he thought, two years, was made Chairman; and by an unfortunate fluke, he might say, the other gentleman was not made Vice-Chairman. There were men who had served on the Committee ten times the period those two gentlemen had.

"I ask you," continued Dr. Milner, "is it advisable that members of a Committee should belong to any Company that does trading with that Committee? Now, I think you have got some part of the secret of the management of the gas undertaking. It is an extraordinary thing that a certain Company who years ago did a large amount of trading with the Corporation, after the advent of Mr. Brown on the scene—for very good reasons, I suppose—did not do so much trading with the Committee. And so these gentlemen were not satisfied. I do not think I am divulging more than I ought to; but I will tell you this—on one day, after the *agenda* paper had been finished, as is only natural, most members of the Committee went home. Well, it was very extraordinary that on a certain day, after all the Conservative members of the Gas Committee had left the room, they (the Liberal members) appointed a Sub-Committee of four Liberals to investigate the qualifications and the goings on of the Engineer. I will say this—one member of the Committee, and all honour is due to him—that was, Alderman Ford—declined to have anything more to do with them. And it seems that the other gentlemen who formed the Committee brought in a report saying that they were not satisfied with the conduct of the

Engineer (that they were not satisfied with his working); and on their own responsibility they recommended—two gentlemen had only been on the Committee eighteen months—the Committee to dismiss the Engineer. I moved, and it was carried, that Sir George Livesey should be called in to report on the gas undertaking. I can tell you this—I have not been in good favour since. I am not afraid of my conduct on that Committee. I am not afraid of any of the reports of this secret commission coming out; and I am anxious to know why they should not come out. The Committee were asked, or rather the Acting-Chairman was asked, to give evidence before that Committee; and he was not told that he was to give it in confidence—there was no question of confidence and no secrecy about the matter. He was asked to give evidence. The Committee, agreeing with him, asked if we should know what the charges were. We were told: 'Oh, no; we shall not tell you the charges. You have got to give evidence.' 'Oh,' he said, 'we have no special evidence to give. We are quite satisfied with the way things are going on; and now the disturbing element of the Gas Committee is removed, we shall get along all right.' The charges resolved themselves, as you are well aware, into the late Chairman and one or two other gentlemen getting up in the Council and making serious and grave charges against the Engineer. The Engineer had no opportunity of replying to the charges. It is common property that the Committee asked that the inquiry should be held in public, and that everybody should know what was going on. The Engineer is anxious, and was anxious, that the inquiry should be made public. When charges were brought against him, he was the man who said: 'Why are they not made public?' Do you think that if the Engineer had been quite wrong, had been absolutely in the wrong, the inquiry would not have been made public? The remnant of the Gas Committee backed up the Engineer. Well, then I want to know who the culprits are. I think it is the right of every ratepayer in the city to demand an inquiry. There has gone up a representation that there shall be a Local Government Board inquiry; but I understand on very good authority that pressure is even brought to bear to try to prevent that. It is a scandalous state of things that the party who boast that they have governed the town so well for forty years should endeavour to stifle what is a very grave scandal at the present time; and I wish to say, in passing, that though this report is not made public, yet a certain gentleman—Mr. Sands—in a speech he made the other night, seems to know a good deal more about it even than I do. I may remind you that Mr. Sands is the gentleman who ought to have been the Vice-Chairman. There was a big outcry before the Investigation Committee was appointed; and the biggest outcry was raised by the Liberal members of the Corporation. But now they want to hush it up. They talk of it as a trivial matter; and you are to know nothing. You are to be content that such a scandal should go on and reappear in the future. So long as you can have men interested in Companies on a Corporation, and they do trading with the Committee of that Corporation, you cannot expect to have pure government. If it is not possible, as the Council decided that it was not right, for land agents and lawyers to be members of important Committees, then surely it is not right that any man having interests in outside Companies should have anything to do with the Committee that trades with that Company." (Applause.)

THE PROPOSED GAS TRANSFER AT LANARK.

Report by Mr. W. R. Herring.

The following report by Mr. W. R. Herring, of Edinburgh, upon the condition of the works of the Lanark Gas Consumers' Company, which it is proposed to acquire, was submitted to the Town Council at a special meeting last week. Although consideration of it was delayed, it was ordered to be made public.

In accordance with instructions received from your Town Clerk, I have visited Lanark, and the Lanark Gas Company's property—being accompanied on that occasion by the Provost, Bailie Keith, and the Town Clerk. I made a thorough inspection of the works, plant, and buildings comprising the gas-works, so far as they are visible and above ground. The gas-works are situated on a somewhat constricted area of land, the whole of which is now occupied by buildings or plant. So far as the equipment is concerned, however, both the manufacturing and the subsidiary plant, excepting the gasholders, are fully equal to present-day requirements, and have a normal margin in their capacities to meet immediately increasing demands for gas. The plant throughout the gas-works is in a good state of repair. Much of it, in fact, is comparatively new, having been put down during the past few years, excepting the small gasholder, which is in a very leaky condition, and requires re-sheeting. The tank belonging to this gasholder is also leaky; and it is questionable whether any value can be set upon this portion of the Company's property—particularly in view of the fact that additional gasholder storage must be provided to enable a satisfactory pressure to be maintained in the district during the heavy lighting hours in the winter season, and also to ensure a satisfactory and constant supply with the present manufacturing plant. Provision was, I understand, made for the erection of an additional gasholder; but its construction has been delayed pending the present inquiry.

The locality of the works, situated as they are some distance from railway communication, cannot be considered as altogether satisfactory, particularly if there is any possibility of considerable development in the supply in the future; and, further, I understand, there is some difficulty in acquiring additional land adjoining the present works. As additional land must be immediately provided for the gasholder which it is necessary to put down, it may be pointed out that its locality is not of any material importance to the manufacturing section. A gasholder can be placed at any convenient position within the area of supply, provided a trunk main leading from the gas-works to the gasholder can be laid at reasonable cost.

The distributory system of the Company was not examined, owing to the physical impossibilities of carrying out such an examination. Its condition, however, can be judged inferentially. On the 20th of July, I asked for certain information from your Town Clerk as to the expenditure under the heading of "New Mains, New Service-Pipes, Repairs of Mains, and Repairs of Service-Pipes;" and I am informed by the Secretary of the Company, through your Town Clerk, on the 3rd of September, that such records for the previous ten years cannot be given. He, however, mentions "that since 1893 the Company have laid 3406 yards of new main pipes (nearly 2 miles), almost one-fifth of the present mileage. And 1086 yards of this amount were extensions of main pipes." The best guide as to the condition of the distributory system—comprising the main-pipes, service-pipes, and meters—is the amount of gas unaccounted for from year to year. From a statement I have prepared, covering a period of ten years, forming an appendix to this report, it will be seen that what is commonly styled the leakage is still very high; and notwithstanding the amount of money that has been spent upon the renovating of the distributory system, it is still evidently in anything but a satisfactory condition. As to its sufficiency for the present requirements, it will necessitate a survey being taken during the coming winter season, in order to test the pressures at various parts of the district of supply during the heavy lighting period. The pressure so recorded, in relation to the pressure at the works, and the known requirements of the public, will show whether or not the main pipes in the principal streets are sufficient in size for the public service.

The Company appear to have had a prosperous financial career; they have, in fact, always earned considerably more money than was necessary to satisfy the shareholders as dividend. Whether the Company were justified in continuing to charge a rate for gas that was earning so much in excess of normal dividend requirements, is a question which need not now be entered into, but is one that may require to be dealt with should closer negotiations result from the present preliminary. To enable a thorough investigation to be made into the position of the Company, both from a financial and from a manufacturer's point of view, I have compiled a statistical analysis from the Company's published accounts, and to which has been added some further information supplied, at my request, through your Town Clerk, by the Company. This statement will show in pretty complete form the exact position of the Company during the past ten years and exhibits at a glance the progress of the Company, and its financial position year by year. In making a valuation of the Company's property, I have proceeded on the basis of purchasing the dividends; averaging the total amount of money paid as dividends during the past three years, 1904-5-6; and assessing that at twenty-five years' purchase. From the sum so arrived at it is necessary to deduct for any deficiencies or dilapidations that may be proved to exist in the Company's property. The provision of a gasholder is of importance to raise the storage capacity to the normal. I am therefore taking the figure—viz., £2500—which the Company propose to spend (the gasholder and tank without land will cost about £1750), and have deducted it from the sum arrived at by purchasing the dividends at 25 years. To the sum of money remaining I have added the amount of debenture capital at date; leaving a grand total of £6691 13s. 4d. Bearing in mind my remarks upon the excessive leakage through its distributory system, and its probable deficient condition, a deduction must be made from this sum to allow for its reinstatement—probably £750; but the exact amount could be better arrived at after the investigations in the mid-winter season to which I have previously referred.

Average dividends during years 1904-5-6 (£291 13s. 4d.), at 25 years' purchase, £7291 13s. 4d. Add amount of debenture stock at close of last balance-sheet, £2650—£9941 13s. 4d. Deduct for deficiency in plant, gasholder below normal requirements, £2500; for distributory system, £750 (£3250) showing a balance of £6691 13s. 4d. This sum is therefore, in my opinion, a fair and full amount for the entire property of the Company, apart from stocks, book debts, &c., bearing in mind all the circumstances, and the fact that the Company have no statutory rights, and have in the past been renewing their plant out of excessive profits earned by charging a higher price for gas than was necessary to pay normal dividends.

Public Lighting at Exeter.—It was reported at a meeting of the Exeter City Council on Wednesday last that it had been found impracticable to complete the details of the new agreement with the Gas Company and the conversion of the street lighting to the incandescent system by Michaelmas, when the old agreement expired. It had therefore been decided that the old arrangement should continue in force for the present, and that the new agreement should become operative at some date mutually convenient not later than Dec. 31. A plan had been prepared by the Surveyor showing the existing streets and the lamps to be lighted by the Company. This was submitted to a Sub-Committee dealing with the question, who directed the Surveyor and Electrical Engineer to confer with the officials of the Gas Company in regard to it, and to bring the plan and the draft agreement up for further consideration at a later date. There the matter rests at present.

Street Lighting in Battersea.—According to the report of the Battersea Borough Council for the year ending the 31st of March last, which has just been issued, the present number of lamps in the borough and the charges for them are as follows: Gaslight and Coke Company, 918 flat-flame lamps, at £3 0s. 8d. each; three incandescent lamps, at £2 17s. 8d. each; and three flat-flame lamps, two at £5 12s. 11d. and one at £5 5s. 4d. South Metropolitan Gas Company, 861 incandescent lamps at £2 18s. each. Wandsworth and Putney Gas Company, 43 incandescent lamps at £2 13s. 7d. each; and 10 flat-flame lamps, at £3 0s. 5d. each. Battersea Borough Council, 359 electric arc lamps, at £18 per lamp; 22 small ditto, at £10 each; and 213 Nernst lamps, at £6 each. In all cases the prices that are quoted include the cost of maintenance. In addition to the foregoing, it may be mentioned that there are metered gas-lamps in three streets in the South Metropolitan Company's district, and in six streets in that of the Gaslight and Coke Company.

MERTHYR TOWN COUNCIL AND THE GAS-WORKS.

Purchase Proposal Negatived.

The Merthyr Tydvil Town Council held a special meeting on Monday of last week to consider the advisability of promoting a Bill in the next session of Parliament to empower them, among other things, to acquire the undertakings of the Merthyr Tydvil Gas Company and the Dowlais Gas and Coke Company. It was explained at the opening that if the gas-works proposal was not agreed to the other portion of the Bill would not be proceeded with.

This portion of the contemplated Bill was therefore taken first; Mr. Frank T. James, the Chairman of the Parliamentary Committee, moving that the Corporation should seek authority to manufacture gas and to purchase the two works named. He referred to the opposition which was offered to the proposal, and said that, assuming the resolution was carried then, a poll of the ratepayers would be demanded, and therefore the Council were not the final court of appeal in the matter. In approaching the subject, he asked them to regard the Corporation area as a whole; and though the terms of the motion did not permit him to propose the purchase of the Merthyr Vale and Quaker's Yard gas concerns, the resolution would enable the Corporation under their Bill to take power to supply the whole of their area. He had no doubt that Parliament would give them this power, because both the Companies were non-statutory, and had no right to lay any mains without the consent of the Corporation; and they charged as much as 5s. per 1000 cubic feet for gas. If the Corporation did not endeavour to purchase the two Companies' undertakings now, and supply the whole area, they would never have so favourable an opportunity again. If it was necessary to deal with the whole district, he saw no injustice in putting the price of gas in Merthyr up to 3s. per 1000 cubic feet. They had paid this price before and made no complaint; and when once the Corporation became the proprietors of the gas-works, they must do the best they could for the ratepayers as a whole. It was not the intention to scrap the Dowlais Gas-Works. All they would do would be to refrain from renewing the works from time to time. The resolution was seconded by Mr. W. R. Edmunds, who dealt with the argument of the opposition that they would have to pay an enormous price for the undertakings, and that when the Corporation had got them, they would not pay. He said that Leicester last year made a profit on the gas-works which enabled them to contribute a sum equal to 10¾d. in the pound to the rates, Salford 7d., Bolton 6¾d., Blackpool 10½d., Wigan 1s. 7¼d., Rochdale 8½d., and Warrington 10¼d. Those figures, he argued, were convincing. It would be a humiliation if they in Merthyr could not manage their gas-works as well as other towns; and he was convinced that the business would pay remarkably well.

The opposition was opened by the reading of letters from the Merthyr, Dowlais, and Merthyr Vale Chambers of Trade. This Mr. Arthur Daniel followed up by suggesting that new facts had come to light which had altered the opinions of some of them with regard to the purchase, and that even Mr. James was speaking without conviction. The time for purchasing gas-works had long since gone by. They were out of date; and such enterprising places as Cardiff, Newport, and Swansea had persistently left them alone. The price they would have to pay for the Merthyr and Dowlais concerns would be not £82,000, as estimated by Messrs. W. A. Valon and Son, the Engineers who had reported on the proposal, but £98,752; and, in addition to this, Messrs. Valon's estimate was based on the 1904 working, when the price of gas in Merthyr was 2s. 11d. and 3s. 3d. per 1000 cubic feet, whereas to-day there was a uniform charge of 2s. 9d. Four other local authorities working under similar conditions to Merthyr, who had purchased their gas-works, now charged an average of 3s. 10d., or 1s. 1d. per 1000 cubic feet above what was paid at Merthyr. Gas was a declining industry, and electricity was likely to monopolize the whole field; and they should, in these circumstances, not purchase the gas-works, which would not pay, but at an opportune time promote an electricity scheme, or acquire the undertaking of the local Electric Lighting Company. Alderman David Evans and Mr. F. S. Simons also spoke in opposition; the latter deploring the fact that no arguments for purchase had been advanced. It had, he remarked, been said that the slot-meter system was not encouraged in the district. The slot meter was of small advantage without the gas-stove; and since colliers constituted the majority of the people, and they obtained their coal at a very cheap rate, they would never use gas-stoves in ordinary houses. He opposed the proposal because he did not see how the works could be conducted at a profit without a differentiation of charges between the various parts of the borough; and this was absolutely wrong in principle. Another member—Alderman Harris—advocating an electricity scheme rather than the purchase of the gas-works, pointed out to the Council the success he thought likely to result from combining a refuse destructor, an electric lighting installation, and a tramway system.

On the side of the gas purchase proposal, Mr. Francis quoted seven towns, comparable in size to Merthyr, where profits to the amount of £52,580 were last year made in relief of the rates, when the prices charged were low. These included Barrrow, where the charge was 2s. 6d. per 1000 cubic feet, Coventry 2s. 1d. and 2s. 6d., Devonport 2s. 6d., Rochdale 2s. 10d., and Smethwick 2s. 3d. to 2s. 9d. Mr. James, in replying to the discussion, also pointed out that London was reverting to gas for street-lighting purposes.

When, however, a vote was taken, twelve members voted for the resolution and sixteen against. The resolution was therefore declared lost; and the other proposals were dropped.

Gas Suffocation Case at Warrington.—Last Sunday week, Mr. Francis Dixon was found by his son lying in bed unconscious at his house in Warrington. The room was full of gas; the tap being turned on. Artificial respiration was tried, but without avail. Deceased, who was 78 years of age, formerly took a prominent part in the affairs of the town.

THE WATER-GAS QUESTION AT LIVERPOOL.

The Suggested Deputation to the Local Government Board.

The projected deputation on the subject of water gas from the Liverpool City Council to the Local Government Board was referred to at the final meeting of the Council for the present municipal year, which was held last Wednesday.

It had been arranged that the deputation should consist of the Chairman and Deputy-Chairman of the Committee, the Medical Officer of Health, the Deputy-Clerk, and Dr. Caton; but Mr. Morrissey now moved that the Deputy-Chairman and Dr. Caton should be omitted. He said he thought the three remaining gentlemen would be sufficient to form the deputation; and he added that it was not much use their protesting against the poisonous gas being supplied, when they might produce their own gas. He urged that the Corporation should either go in for manufacturing their own gas or popularizing the electric light system, and thus take themselves out of the "exploited Gas Company." Alderman Smith, on the other hand, wished the deputation to be as strong and full as possible; while Mr. Sexton "did not see why a tailor and draper should be included on a deputation of this kind." Mr. Taggart argued that they should not always send officials on such business, as the Council were too much official-ridden. They were face to face with the calamitous effects of this gas; and he felt that the Health Committee would not be doing their work if they did not inquire into the matter. Sir Charles Petrie remarked that although the Departmental Committee recommended that not more than 12 per cent. of water gas should be mixed with coal gas, in many parts of Liverpool 48 per cent. of water gas was supplied. He thought the cost of a few members going to London was a paltry matter compared with the importance of the question. It was their duty to see that an obnoxious gas of this character was not sent out to the detriment of anyone in Liverpool. Mr. Crosthwaite said those of them who resided at the east end of Liverpool, nearest to Garston, where "this obnoxious, infamous gas" was made, were the greatest sufferers. He hoped something would be done to bring the matter before the Gas Company, and make them recognize the danger of water gas.

Mr. Morrissey's proposal was overwhelmingly rejected.

THE GAS POISONING CASE IN LIVERPOOL.

The inquiry into the circumstances attending the deaths of William Park Barton and Arthur Tollit, which occurred a few weeks ago as the result, as was supposed, of inhaling coal gas at No. 29, Williamson Street, Liverpool (see *ante*, pp. 116, 199), was concluded last Thursday by Mr. T. E. Sampson, the City Coroner. The proceedings were watched on behalf of the Liverpool United Gas Company by Mr. Garnett, their Solicitor, and Mr. Edward Allen, their Engineer. In the course of the inquiry, the Coroner elicited the facts that on the night of the fatality the door of the bedroom where the victims were sleeping was fastened, as was also the window, and that there was no fireplace in the room, which was a small one. Moreover, the tap of the gas-bracket was very loose, and not provided with a stop. He therefore suggested to the Jury the probability that Barton, when he got into bed, had reached up to put out the light, and by mistake had turned the tap on again. It was ascertained from the medical witnesses that he had died from asphyxia, partly due to carbon monoxide. The child Tollit, however, died from pneumonia, following gas poisoning. Dr. Bushby gave it as his opinion, after having made a post-mortem examination of Barton's body, that the gas which poisoned him did not contain a larger proportion of carbon monoxide than was to be found ordinarily in coal gas—about 5 or 6 per cent. Mr. Allen stated that in the Williamson Street district, between 11 p.m. and 6 a.m., the gas supplied did not contain any carburetted water gas. It was ordinary coal gas, which, as Dr. Bushby had stated, contained the usual proportion of carbon monoxide. There was a danger of confusing the terms. Carburetted water gas was one thing, and carbon monoxide another. Addressing the Jury, the Coroner commented on the crowded condition of the bedroom, the entire lack of ventilation, and the looseness of the gas-tap, and remarked that the case should act as a warning to householders to see that their taps were always in good order. He thought there should be some authority for periodically inspecting gas-fittings in houses; and he suggested that it would be a good thing if the Gas Company, in sending out their demand notes, would point out the dangers that were likely to result from having loose taps on the premises. The Jury returned a verdict in accordance with the medical evidence; adding that the poisoning was caused by defective gas-fittings.

COVENTRY AND A GAS SUPPLY TO ALLESLEY.

At the Meeting of the Coventry Corporation last Wednesday, the Gas Committtee reported having re-considered their minute of the 19th ult. with respect to the extension of the gas-mains to Allesley, which was referred back by the Council on the 25th ult. (see *ante*, p. 56) and a further communication of Mr. W. I. Iliffe on the subject; and they resolved that Mr. Iliffe be informed that the Committee were prepared to extend the mains to Allesley on the following conditions: (1) Mr. Iliffe to pay one-third of the cost, amounting to £693, of laying the main from the city boundary to Allesley, and (2) give a guarantee to the Corporation that for seven years the following quantities of gas should be paid for: During the first year 1,000,000 cubic feet, and during the second and subsequent years 1,120,000 cubic feet. Mr. Poole moved, as an amendment, the deletion of the first paragraph. He argued that they should not tax prospective customers in this way; that Allesley was in Coventry's area of supply, and that the Corporation should not adopt any dog-in-the-manger policy; that Allesley would take more and more gas and become a good customer;

that they would pay 6d. per 1000 cubic feet more than was charged in the city; that in consequence of the increasing traffic there was need for lighting along the main road; and that when Allesley had water and gas, many people might go there from Coventry, and relieve the congestion. Mr. Smith, in seconding the amendment, said he did not understand the disinclination to extend. The Gas Engineer told them he always found, when they got over the first year or two, that they had a good thing. In this case, they had a guarantee for seven years, and there was no danger of loss. Alderman Andrews said it was the policy of the Gas and Water Departments to ask customers, when the delivery was at a distance, to pay towards the cost of the special main. At the price proposed to be charged to Allesley, it would take 28 years of profits to pay the actual cost of the main. After some discussion, the amendment was defeated by 16 votes to 9. A further amendment was moved, to omit the guarantee; but Alderman Andrews pointed out that this was contrary of the policy of the Gas Department. The amendment was eventually defeated, and the Committee's minutes were confirmed.

TYNEMOUTH GAS-WORKS EXTENSIONS.

A Visit of Inspection.

On the invitation of the Chairman and Directors of the Tynemouth Gas Company, a visit was last Wednesday paid to the works by the Mayor and Corporation of Tynemouth and the Chairman and members of the Whitley and Monkseaton and the Earsdon Urban District Councils, who inspected the new gasholder and other additions. The capacity of the holder is 1½ million cubic feet, and the cost of its construction has been between £15,000 and £16,000. The Contractors were the Whessoe Foundry Company, Limited, of Darlington; and the work has been carried out under the supervision of the Gas Company's Engineers (Mr. W. Hardie and Mr. A. C. Hovey). The guests were met at the works by Mr. J. B. Williamson, the Chairman, and other Directors, and were divided into two parties, of whom Mr. Hardie and Mr. Hovey took charge. Mr. Williamson explained that the Company had been twice before Parliament within the past ten years, and had been authorized to raise £300,000 of additional capital; and the gathering was arranged to let the representatives of the Local Authorities and the public know how the money, or a great portion of it, had been expended.

After the inspection, the visitors were entertained to luncheon. Mr. Williamson presided, and, in proposing "The Mayor and Corporation of the County Borough of Tynemouth," said that the one object of the Company in spending money on new works was to enable them to supply gas at the very lowest possible price, and to keep up the quality. Other toasts included "The Tynemouth Gas Company;" and in responding to it, the Chairman gave emphasis to the fact that a uniform rate for gas was charged throughout the Company's district. He said that this fact helped the Directors to develop their industry enormously. He remarked that the whole of the works had been designed, the bills of quantities prepared, and the operations superintended, by the Company's own Engineers—Mr. Hardie and Mr. Hovey.

THE SALE OF COKE AT BINGLEY.

As was reported in the "JOURNAL" for Sept. 25 (p. 844), the plan adopted by the Bingley Gas Committee for the sale of coke in large quantities by contract to persons outside the district, has led to some dissatisfaction among the ratepayers, who maintain that they are thereby compelled to pay a higher price than heretofore, owing to there being no longer any necessity to lower prices for the sake of getting rid of stock. The Gas Engineer (Mr. Harold Smith), however, reported that the contracting plan showed a large monetary gain compared with the other; and consequently the Committee recommended its continuance. When this came before the Council, an amendment was carried (by the casting-vote of the Chairman) referring the matter back to the Committee, with an instruction that information should be given as to the manner in which the Gas Engineer had arrived at his conclusion.

When the Council met a fortnight ago, the Chairman (Mr. W. Hartley) asked why no reference was made to the question in the Gas Committee's minutes; and Mr. Towler, in reply, said that, as a proposal was to be moved that all previous resolutions relating to the subject should be rescinded, they had considered it useless taking action until they saw the result of the motion. Anyway, there was plenty of time, for the contracts had been made out for another twelve months. Mr. Dawson explained that the resolution which he intended to move was simply to clear the ground. If it was carried, they would not be in any settled position.

Later on, Mr. Dawson moved his resolution, and remarked that it seemed to him to be unfair that while they sold coke to an outside contractor at the rate of 5s. 6d. per ton, they were charging their own consumers 9s. 2d. for the same article. Everything tended towards an injustice being done to the Bingley consumer. Mr. Towler, however, said that the lowest contract was fixed at 6s. 10d., though no doubt the price would work out at 5s. 6d. when the carting was deducted. The Gas Engineer pointed out that the average price was 6s. 4d. with the carting taken off. Mr. Alfred Hartley said that, whatever price they fixed for their coke in Bingley, or however low it was, there would always be a surplus left if they depended on their own ratepayers alone; but it did seem hard that the ratepayers should have to pay so much more than outsiders. They had to lower their price by contract so as to make allowance for what it would cost to carry the coke to its destination; and possibly the purchaser would have to pay as much as the Bingley consumer. Their neighbours, Keighley and Shipley, had had to pay more for their coke than the Bingley consumers. Mr. Atkinson failed to see that the ratepayers suffered any injustice, as there was no reason why 4000 or 5000 gas consumers should pay a tax in order that coke should be sold at a low price. Mr. Parker also thought that the greater portion of the ratepayers would suffer if the old system was reverted to; and Mr. Nunns was of the same opinion—pointing out that there were a hundred poor gas consumers to one poor coke consumer. Mr. Dawson said that the issue was simple. His proposal was to rescind the motion of 1903, that the Chairman of the Gas Committee and the Engineer be empowered to settle contracts for coke. The general question was an objection by the ratepayers themselves to the system at present in vogue. They had a grievance; and the general opinion was that it was not fair that outsiders should be able to purchase at a cheaper rate than they as ratepayers could.

It was pointed out that Mr. Dawson required a two-thirds majority to carry his motion; and on being put to the vote, it was lost.

NEWBURY CORPORATION AND GAS-FITTERS.

The complaint of interference with private traders by municipalities who undertake gas-fitting and the sale of apparatus has become a familiar one; and it now falls to Newbury to be added to the number of places where the question has arisen.

Some time ago, a sum of over £100 was spent in adapting premises for the purpose of a show-room in the town for the sale and exhibition of gas heating and lighting appliances—a course which was necessitated by the introduction of electricity, accompanied by the usual methods of canvassing, which won over a good many of the gas consumers. The result was so successful that the local gas-fitters prepared a memorial for submission to the Gas Committee in which, after enumerating certain cases in which work had been done by employees of the department, they pointed out that their own trade was thereby "most seriously prejudiced." Under these circumstances, they desired to know whether the course complained of had been adopted with the knowledge and sanction of the Committee; and, if so, whether they regarded it as a justifiable form of municipal trading. The Committee, in their minutes, stated that the memorial had been laid before them, and that the Manager (Mr. W. R. Davey) had given satisfactory explanations—the cases mentioned by the memorialists being quite exceptional.

When the minutes came last week before the Town Council, Alderman Smith, the Chairman of the Gas Committee, said they were quite convinced that they were not injuring the rights of private traders. Some of the members, however, did not agree with this. Mr. Elliott remarked that when the show-room was opened the Council emphatically stated that they were not going into competition with the gas-fitters of the town; and they ought to stand by this. Mr. Harris sympathized with the feelings of those who signed the memorial; but at the same time he recognized that there were special circumstances to consider, as the Manager had assured the Committee that if he had not intervened and carried out the work, in all probability the consumers referred to would have resorted to the electric light. Alderman Lucas (the late Chairman of the Gas Committee) pointed out that there was no desire to interfere with the business of the gas-fitters; but it was well known that while the electric light people gave every assistance in the choice of fittings, the town gas-fitters never attempted to show what could be done with gas. Now a display of up-to-date fittings had been made; and when people had liked them, they had been advised to get similar ones from their gas-fitters. Some, however, had said that unless the Gas Committee did the work, they would not have it done at all. In the majority of cases it had been people who were not satisfied with the electric light who had come back to gas because the Manager had shown them what could be done. In this way, they recovered several of their old customers. After some further discussion, Alderman Smith said it was not intended that the show-room should be a means of competitive trading. He did not think the Manager had gone out of his way to get business; and the Council might rest assured that they would do nothing to enter into competition with the traders of the town. The Gas Department was carried on for the benefit of all alike; and all its expenditure came under the control of the Council. But he hoped they would not begin to place restrictions upon the Committee as to the way they should do their work. They would continue to do what was right; and he trusted they would not be hampered.

The report was then adopted.

GAS AT THE BREWERS' EXHIBITION.

At the Brewers' Exhibition held at the Agricultural Hall from the 20th to the 26th inst., there were, as usual, a few stalls which call for notice in our columns. Dealing first with lighting, Messrs. George Bray and Co., Limited, had a good representative collection of burners, comprising their new "C" incandescent burner, provided with an adjusting screw and bye-pass; their reversible inverted burner, with switch coupling for their pneumatic distance lighter (shown in action); and their flexible-tube anti-vibrating pendants. The stand was not large; but the firm made a very effective display on it, and it attracted much attention. The Electroform Incandescent Gaslight Company showed their inverted light, which burns at the same angle as the electric light, and by the use of which they claim that an illuminating power of between 70 and 80 candles can be obtained with a consumption of about 2½ cubic feet of gas. They also had on view their inside high-power lamp. Turning to the other uses of gas, the Richmond Gas Stove and Meter Company, Limited, had a special display of all kinds of cooking apparatus suitable for hotels, restaurants, clubs, &c., as well as a large assortment of gas cooking and heating stoves, and complete installations for ordinary and prepayment supplies. Their stand was brilliantly lighted by Bray's incandescent burners, and was one of the most attractive in the exhibition. Messrs. S. Clark and Co.'s stand was rather smaller than hitherto; but it nevertheless had upon it a good collection of their "Syphon" bar stoves, counter mullers, urns, gas-radiators, &c. Maughan's Patent Geyser Company,

Limited, had on view their geysers and instantaneous hot-water heaters and gas-boilers; a feature of their stand being a multi-supply geyser for sending hot water to all parts of a house. It is scarcely necessary to add that Messrs. Crossley Bros., Limited, occupied their usual place in the hall, and showed two sizes of gas-engines, a small oil-engine, and suction gas plant capable of supplying gas for engines of from 12 to 24 brake-horse-power. This plant was capable of driving the larger gas-engine shown, which would develop 16 effective horse power with ordinary gas, and 12½-horse power with suction gas, at a speed of 250 revolutions per minute. This engine was connected with a dynamo for lighting the stand.

CEARA GAS COMPANY, LIMITED.

An Increased Dividend.

The Annual General Meeting of this Company was held on Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. J. DARELL BLOUNT in the chair.

The SECRETARY (Mr. George R. Guyatt) having read the notice convening the meeting, and the Auditor's certificate, the report and accounts (which were noticed in last week's "JOURNAL," p. 267) were taken as read.

The CHAIRMAN thought the accounts showed a favourable result on the twelve months' working to June 30; and he trusted they would be received with satisfaction by the shareholders. There was, however, one unfortunate item in the revenue account—that was "The loss by fire at Ceara." After a fight extending over some years, during which decisions were given in the Ceara Law Courts against the Company, the Directors determined that it was desirable—and not only desirable, but absolutely necessary—to effect a compromise, so as to avoid the further heavy costs of an appeal to Rio de Janeiro, with the very doubtful chance of obtaining a fairer decision. The settlement effected was reported to the shareholders in a special circular last March. The make of gas per ton of coal for the year under review was better than that for the previous twelve months; and there was also an increase of nearly 9 per cent. in the rental. There had been a small increase in the amount the Company had been able to invest in India 3 per cent. stock. The Manager (Mr. Herbert Gandon), who was sent out last year, reported that the works were in a very excellent condition; and this was exceedingly satisfactory. In conclusion, he moved the adoption of the report and accounts.

Mr. F. A. WALLROTH seconded the motion.

Mr. R. M. LONG, referring to the fire, asked whether an insurance had been effected to cover any similar claim should such a thing occur again.

The CHAIRMAN replied that an insurance had been effected to cover every liability which their experience seemed to point to its being necessary to cover. Everything possible was insured at the time of the fire; but the claim made was of such an extraordinary nature that it embraced things which the Company were unable to insure. As far as they could, however, they had insured against such claims in the future.

Mr. LONG then referred to the rate of exchange, and said that years ago some of the gas companies used to work out the rupee at 2s.; but now they calculated their accounts at a much lower rate, so that the exchange was a smaller sum.

The CHAIRMAN replied that the question of exchange was rather out of the control of the Board; and the reason why the amount was higher on the present occasion than it was twelve months ago, was that they had had larger amounts of money remitted to this side. They must commence with the exchange at par, and, whatever sum it was written down to, the deficiency must be made up in some way or other. When the Company first started, the exchange was about 27d., whereas it was now something like 15½d. The item of exchange was a most unfortunately large sum.

The motion was then carried unanimously.

The CHAIRMAN then proposed, and Mr. F. W. BROTHERS, seconded, the payment of a dividend of 5 per cent. on the preference shares (less income-tax), and of 4 per cent. on the ordinary shares (tax free) for the six months to June 30—making with the interim dividend already paid, 10 per cent. on the preference shares and 6 per cent. on the ordinary shares for the year. This was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. THOMAS GUYATT, Mr. Wallroth was re-elected a Director; and on the motion of Mr. T. M'MAKING, seconded by Mr. LONG, Mr. Magnus Ohren was re-appointed Auditor to the Company.

Mr. M'MAKING then proposed a hearty vote of thanks to the Chairman and Directors. He remarked that the report and accounts were most satisfactory in every way, as regarded the working of the Company. The loss sustained by the fire was regrettable; but it was, of course, a matter over which the Board had no control. A very gratifying feature was the increase of 1 per cent. in the dividend.

Mr. LONG seconded the vote, and it was carried.

The CHAIRMAN, after returning thanks, proposed a similar compliment to the officers of the Company both in Ceara and in England.

Mr. WALLROTH seconded this; and it having been passed,

The SECRETARY briefly acknowledged the vote on behalf of himself and the other members of the staff.

Deptford Public Lighting.—At the meeting of the Deptford Borough Council on Tuesday, the Surveyor presented a report with regard to the rearrangement of the public gas-lamps. He stated that the actual cost of lighting in 1898, under the old flat-flame system, was £4460. The annual cost of lighting under the present incandescent system, together with the increased consumption of gas owing to the various improvements made, will be practically the same. The saving effected in the change from the flat-flame to the incandescent system is sunk in the cost of the increased cousumption of gas and improved lighting, greatly to the benefit of the borough generally.

METROPOLITAN WATER BOARD.

Proposed Unification of Rates.

It will doubtless be in the recollection of some of our readers that at the last meeting of the Metropolitan Water Board before the recess, a long report was presented by the Appeal and Assessment Committee on a proposed uniform scale of charges for water. It was the outcome of an investigation undertaken in virtue of the provision in the Metropolis Water Act, 1902, requiring the Board, within three years after the "appointed day," to introduce into Parliament a Bill providing for uniform scales of charges applicable throughout the limits of supply. The Committee came to the conclusion, after examining exhaustive tables and returns submitted to them, that the maximum rate to be authorized for water used for domestic purposes, including baths, water-closets, and high service, should be 5 per cent. according to the annual value of the premises. They arrived at this opinion on the merits of the whole position. The maximum proposed is the one that is already prevailing in the East London and Southwark and Vauxhall districts. In effect, therefore, the Committee proposed to extend this maximum uniformly throughout the limits of supply, but at the same time to abolish the additional charges for baths, water-closets, and high service which are now levied. They also recommended that the Board should, at the request of any person who is actually consuming water for domestic purposes within the limits of supply, afford to such consumer, at a price not exceeding 1s. per 1000 gallons, a supply of water for other than domestic purposes. The matter was referred to the Finance Committee, who have made a report, in which they have dealt exhaustively with the whole question.

The Committee open their report with a few general remarks upon the Board's financial position under the above-named Act, and then say that, after careful consideration, they have come to the following conclusions: "(1) That the Board are expected, in any arrangement which they may make for equalizing the water charges, to do so without aid from the ratepayer; and (2) that the scheme of equalization should, as far as circumstances will permit, provide an income equal to that which would have been produced had the scales of charges authorized by the Acts of the Water Companies continued to apply." They point out that the most important questions arising out of the Appeal and Assessment Committee's recommendations are the maximum scales to be fixed for the supply of water for domestic purposes, the basis of assessment for these purposes, and the charges for water supplied for non-domestic and public purposes. Having dealt at some length with the financial aspect of the first question, the Committee show in tabular form the effect of the adoption of the proposed uniform scale of 5 per cent. and of two suggested graduated scales—one arranged for a rate of 4 per cent. on annual values not exceeding £30, of 6 per cent. above this and under £200, and 5 per cent. when they are more than £200; and the other for a rate of 4½ per cent. on values under £30, 5 per cent. when above £30 and not exceeding £100, and 5½ per cent. when higher than this figure. In the first case, a deficiency of £21,162 is shown in the gross revenue at September, 1905, an excess of £11,993 in the second, and a deficiency of £18,020 in the third.

The next question considered is the basis of assessment; and the conclusions come to by the Committee are that, while it is desirable that there should be a uniform basis upon which the charges for the supply of water for domestic purposes should be levied both inside and outside the Metropolis, this object would not be attained by merely legislating for the adoption of rateable value as the basis of assessment throughout the limits of supply. They suggest that the Government should be requested to bring in a Bill to unify the procedure of rating and assessment throughout the country, in which event there would be no difficulty in obtaining an extension of the Water-Rate Definition Act, 1885, to the whole of the Board's area. As the law of rating outside the Metropolis differs materially from that which obtains inside, there is a lack of uniformity in assessment practice. Furthermore, the Valuation (Metropolis) Act, 1869, prescribes a scale of maximum deductions from the gross value to arrive at the rateable value; whereas outside the Metropolis no scale of deductions is obligatory upon the assessment authorities. If rateable value were generally adopted throughout the limits of supply, the Committee hold that there would be a substantial loss of revenue to the Board; and in the event of this resulting in the necessity for a rate-in-aid being levied under section 15 of the Act of 1902, authorities within London would be called upon to contribute to a deficiency caused by under-assessment outside the Metropolis. The Board could not hope, in the opinion of the Committee, to succeed in the proposal to adopt rateable value as the basis of charge outside as well as inside the Metropolis, unless the whole of the authorities throughout the limits of supply concurred therein—an event which, in the circumstances, they consider improbable. They therefore recommend—"That no change be made in the proposed Bill in the present method of arriving at annual value for water-rate purposes in the area outside the Metropolis, and that His Majesty's Government be requested, at the earliest opportunity, to introduce a Bill into Parliament to unify the law of rating and assessment both inside and outside the Metropolis."

The Committee next take up the question of supplies by meter for non-domestic and public purposes. They point out that the operation of the scale proposed by the Appeal and Assessment Committee would produce an estimated increase of revenue to the amount of £43,496 from this source. With regard to water supplied for public purposes, they think the Board will sustain some loss by the other Committee's proposal; and they put this down at £11,000. As to meter-rents, they estimate a loss of £9000 a year by the proposal submitted to them.

Summing up the financial results of the suggestions of the Appeal and Assessment Committee, the Finance Committee say they are satisfied that they will produce approximately the income which would have accrued had the existing charges not been distributed; and they show it by the statement on p. 336.

The Committee conclude by saying that the adoption of either of the graduated scales numbered 1 and 4 in lieu of the uniform rate of 5 per cent., in conjunction with the other proposals of the Appeal and Assessment Committee, would produce an excess of gross revenue

—	Gross Revenue, September, 1905.	Estimated Gross Revenue Accruing under the Recommendations of the Special Committee.		
		Total.	Excess on Gross Revenue at September, 1905.	Deficiency on Gross Revenue at September, 1905.
Domestic supplies . . .	£1,849,598	£1,828,436	..	£21,162
Meter Supplies—				
Non-domestic purposes .	301,037	344,533	£43,496	..
Public purposes . . .	89,066	78,066	..	11,000
Meter-rents	33,219	23,959	..	9,260
Revenue in respect of which no recommendations are made	483,968	483,968	..	..
Total revenue . .	£2,756,888	£2,758,962	£43,496	£41,422

This statement shows an estimated excess of £2074 on the gross revenue at September, 1905.

compared with that at September, 1905, as follows: Scale No. 1, £34,429: Scale No. 4, £5216.

The Appeal and Assessment Committee also presented a report supplementary to the one considered by the Finance Committee. They pointed out that in their previous report they stated that, pending the application to the extra-Metropolitan areas of the system of quinquennial revaluation which now prevails in the Metropolis, they did not feel justified in suggesting any variation in the existing practice of determining the annual value of premises for water-rate purposes. This view, however, aroused considerable criticism during the debate which ensued, and a motion to adopt rateable value as the basis of assessment was pressed to a division, and received 14 votes as against 16 to the contrary; the eventual result being that the Board declined to express any opinion on the question until full reports on the subject had been submitted to them. They accordingly referred the matter back to the Committee for further consideration. They subsequently received copies of resolutions passed by local authorities immediately beyond the Metropolis, urging the adoption of rateable value throughout the whole of the Board's area; and it was evident to them that there was a considerable consensus of local feeling confirming the view that this principle should now be recognized. The Committee also had before them some statistics prepared by the Finance Committee showing the financial effect of adopting universal rateable value, from which it appeared that the loss of income attendant on the proposal would amount to some £10,000 per annum, assuming that the future water charges were made on a 5 per cent. basis. The Committee were not, however, inclined to attach too much importance to this sum, for if the extra-Metropolitan areas had a real grievance in the matter, this comparatively small proportion of the Board's income should not, they thought, be permitted to stand in the way. On a review of all the circumstances, and in the light of the further information which had reached the Committee during their investigation, and having regard to the fact that the growth of the Board's income was more than sufficient to counteract the estimated loss, they came to the conclusion that, on the whole, the principle of rateable value should now be recognized. They therefore recommended: "(1) That the uniform charges for domestic supplies be assessed upon the rateable values of the premises supplied with water; and (2) that the rateable values of such premises be ascertained by the valuation list in force at the commencement of the quarter for which the rate accrues, or, if there is no such rate in force, by the last rate made for the relief of the poor."

The reports summarized above were presented at the meeting of the Board last Friday, under the presidency of Sir Melville Beachcroft, the Chairman. Mr. G. S. Elliott, the Chairman of the Appeal and Assessment Committee, moved the recommendation of his Committee that the uniform charges for domestic water supplies should be assessed upon the rateable values of the premises supplied with water. Lord Welby, on behalf of the Finance Committee, moved, as an amendment, their recommendation that no change should be made in the present method of arriving at the annual value of premises for the purposes of the water-rate. After a long discussion, the amendment was lost by 14 votes to 28. Mr. Fitzroy-Doll proposed that the recommendation should be referred back, with a view to the adoption of the meter system, or some other equitable method of charge. Sir Vezey Strong seconded the amendment; but it was lost. The recommendation was then adopted by 25 votes to 13. Further consideration of the report of the Appeal and Assessment Committee was adjourned.

The Annual Report of the Board.

The report of the Board for the year ending the 31st of March last was issued on the 23rd inst. It is of special interest, inasmuch as the period covered is the first financial year during which the Board have been wholly responsible for the administration of the undertakings transferred to them. The main characteristic of the work of the year was the gradual completion of the organization of the undertakings under one administration. The principal offices have therefore been consolidated into one central office, three district offices, five receiving offices, five engineering district offices, and one laboratory. Twenty offices were abolished during the year; bringing up to 37 the total number abolished up to March 31 last. In the two previous reports

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	50,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

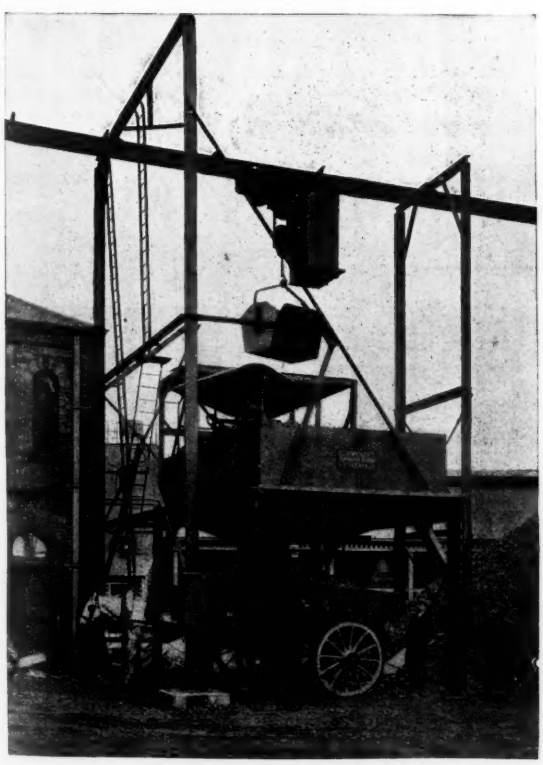
of the Board, brief accounts were given of the proceedings before the Court of Arbitration and the subsequent cases in the Court of Appeal and the House of Lords; but it was not possible to submit a complete statement in regard to the acquisition of the Companies' undertakings, because a number of questions remained outstanding. These are briefly alluded to in the present report. Formal agreements were arrived at for the settlement by the Court of Arbitration of certain questions raised by the Official Auditor (the late Mr. Allen Stoneham) on the final accounts of the West Middlesex Company, the East London Company, and the Southwark and Vauxhall Company; the conditions being that there should be no appeal. The sums at issue involved a total amount approaching £100,000. The two main points in dispute were: (1) The estimated value of certain surplus stores and water in store in the possession of the Companies on the appointed day. (2) As to the obligation to contribute to the City Chamberlain's sinking fund; the point at issue being that the Special Act provided that such contribution was a yearly one, and not an accruing liability from day to day, and could not be apportioned in respect of a period less than a year. The Court of Arbitration allowed the Companies' contentions as regards the sinking fund, but decided that the Official Auditor was correct as regards the omission from the accounts of the estimated value of sundry stores and the water in store. A sum of £500 was granted to Mr. Stoneham in recognition of assistance rendered to the Board; and it was paid to his personal representatives. The total expenditure of the Board for the costs and expenses of the Court of Arbitration amounted to £255,584. From bills delivered by the Board's Solicitors aggregating £84,599, an amount of £8735 was taxed off. From the Companies' total costs of £140,576, an amount of £50,649 was disallowed.

The statement of income and expenditure shows the surplus profits transferred by the Companies to have been £248,050. The revenue account from the appointed days shows an income of £1,991,135, against an expenditure of £1,996,885. Debenture stocks and mortgage loans transferred by the Companies aggregated £11,624,948; and Metropolitan Water "B" Stock issued to the Companies aggregated £32,818,609. With regard to income and expenditure for the year 1905-6, the audit is not completed. It stated, however, as regards the revenue accounts, that the income for the year exceeded the expenditure by approximately £11,000. For the year ended Michaelmas, 1905—the most recent year available for the purpose—the total gross revenue of the Board in respect of water charges under the existing scales amounted to £2,756,888. The total revenue derived from domestic supplies amounted to £1,889,877; the combined supplies produced £170,102, *plus* £108,827 received for supplies to model dwellings, &c.; and the sale of water for non-domestic and public purposes yielded £577,965, of which £415,939 was by measure, and £162,026 by fixed payment.

The water stock to be issued in substitution for the irredeemable debenture stocks was required by the Metropolitan Water Stock Regulations of 1903 to be termed Metropolitan Water "A" Stock. This stock is redeemable at par at the option of the Board after the expiration of a period of 60 years from March 31, 1903. The amount of "A" stock necessary to produce the same income as that derived from £4,365,110 of irredeemable debenture stocks was £6,060,164. The Board considered the expediency of placing the conversion and management of the "A" stock with the Bank of England, as in the case of the "B" stock; but they came to the conclusion that it would be more economical and satisfactory if the work were entrusted to their own staff. The profit not legally distributable as dividends, transferred at the appointed days from the Kent, New River, and West Middlesex Companies, amounting in all to £248,050, was carried to an appropriation account. Out of this were paid the preliminary expenses of £11,128; £200,000 was transferred to a working capital account; and the balance (£36,922) was certified by the District Auditor as payable to the redemption fund applicable to the discharge of the stock and debt for which the period of 100 years has been given by the Metropolis Water Act.

In the portion of the report dealing with the supply of water, and the tabulated statistics accompanying it, it is shown that in the year ending the 31st of March last, 44,904,174,854 gallons of water were drawn from the Thames, or 0·756 per cent. more than in the preceding period, and 16,208,504,541 gallons from the Lea, or 16·412 per cent. less than before; water from other sources bringing up the total to 79,572,570,244 gallons. The average daily supply was 218 million gallons; the general average being 37·58 gallons per head, against 39·73 gallons in the year 1904-5. Of this the southern district took 28·375 per cent., and the Kent district 8 646 per cent. Throughout the whole area there was a decrease in the consumption of water; but in the Lambeth division an increase of 1·484 per cent. was neutralized by a decrease of 2·054 per cent. in the Southwark and Vauxhall division. The most striking feature in connection with the Thames is the increase in the New River supply from this source, which advanced from a little over 6 million gallons in 1904-5 to 614 million gallons, or an increase of 9946 per cent. The eastern district increased its supply by 2·566 per cent. There were slight decreases in the southern and western districts. The southern district (Lambeth and Southwark and Vauxhall divisions) took nearly one-half (48·928 per cent.) of the total supply derived from the Thames. The total supply derived from wells—the purest of the Board's sources—amounted to 17,988¾ million gallons, or an average daily supply of 49·3 gallons. The Kent district received 38 245 per cent. of the total supply from wells south of the Thames. Tests as to purity carried out by Dr. A. C. Houston, the Board's Director of Water Examinations, showed that London water, taken as a whole, contained less than 10 microbes per cubic centimetre. The East London (Thames) and Southwark and Vauxhall supplies contained the greatest number of bacteria, and the New River and Chelsea waters the least. The New River and Lea waters were purer than that of the Thames.

The report closes with a chapter recording the miscellaneous work of the Board, including an epitome of their legal proceedings, and an account of the proposed new works in the Lea Valley.



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WATER PURCHASE SCHEME AT BEVERLEY.

Local Government Board Inquiry.

An inquiry on behalf of the Local Government Board was held last Tuesday by Mr. E. A. Sandford Fawcett and Dr. S. W. Wheaton into an application by the Beverley Corporation to borrow the sum of £22,000 for the purchase of the undertaking of the Water Company, and for certain proposed experimental works of water supply in the parish of Molescroft. The application was opposed by two members of the Council.

In opening the case for the Corporation, the Town Clerk (Mr. J. Willis Mills) observed that the borrowing of the £22,000 was proposed to cover a period of sixty years. The general district rate was 1s. 6d. in the pound for the half year, or 3s. 2d. for the last twelve months; and the poor rate, 3s. for the last twelve months. The population of the borough at the present time was about 13,500. The Corporation were to pay £50 for the right of making a trial bore; the amount to be reduced to £10 in the event of the Corporation concluding the purchase. The present works were established by the Company in 1881. Since that time there has been three outbreaks of typhoid fever in the borough, which reports made by the Local Government Board inspectors showed to be due to contamination of the water by sewage. As the result of these reports, the Town Council resolved in August last to purchase the water-works. The price was £20,850; and the date of completion was to be within two months of the sanction of the Local Government Board. In order to restore the confidence of the public, the Corporation proposed to construct their works on the east of the town, where borings had proved that an adequate supply of pure water could be obtained. In the selection of the new bore, they had been guided by Mr. Baldwin Latham, who had been interested in water supply for the last thirty years, and Mr. John Villiers. As regarded the old works, it was proposed to retain the reservoir and remove the pumps and machinery to the new site. The profit made by the Company last year was £1090.

The first witness called was Mr. James Thirsk, the Secretary of the Water Company, who gave evidence as to the present condition of the undertaking. Then Mr. Baldwin Latham said in his judgment it was absolutely necessary that Beverley should have another water supply. With a supply free from contamination, there would most decidedly be an increased demand. As to the bargain between the Corporation and the Company, he considered it an excellent one. Mr. J. Bickersteth, Clerk to the County Council, favoured the acquisition of the water-works by the Corporation, but thought a better site could be selected than the one chosen for the new bore.

Other evidence was given, and at the close of the inquiry the Inspectors visited the existing works and the site of the new ones.

PLYMOUTH CORPORATION WATER SUPPLY.

Engineer's Annual Report.

The annual report of Mr. Frank Howarth, the Water Engineer of the Plymouth Corporation, which has just been issued, shows that the year 1905 was an exceptionally dry one on the south-western slopes of Dartmoor, where the water-works are situated. The total rainfall for the year was 45·64 inches, which is not only the lowest recorded since 1892; but is 13·5 per cent. under the average for the previous 13 years. In spite of this, the flow of the river at the recording-station did not fall below 3,456,000 gallons. The gathering-ground is 5360 acres; and Mr. Howarth remarks that, compared with other drainage areas, this is a large minimum dry-weather flow. The works carried out during the year included the erection of a new recording-station at the intake of the storage reservoir at Burrator, the concrete walls along the banks of the river, and the construction of a bye-channel for the diversion of the water from the weir pool when necessary. Main extensions covered a distance of 2 miles 415 yards; and the total length of the main is now 127 miles 1053 yards. The new supplies laid on during the year numbered 791; making the total 19,852. The year's income amounted to £32,455, and the expenditure for maintenance and management, £10,165. Out of the gross profit of £22,290, interest and sinking fund absorbed £17,725; leaving a net profit of £4565. Since the trade and miscellaneous charges were revised in 1902-3, there has been an increase of £4404 in the water-rentals—an average of £1468 per annum. In the last ten years, the maintenance and management expenses have gone up to the extent of £2930; while in the same period the gross profit has increased from £11,261 to £17,724, and interest, sinking fund, and other charges from £7811 to £17,724.

An interesting section of the report is that devoted to the question of the consumption of water and the prevention of waste. For some reason, the consumption of water in Plymouth has always been abnormal. In 1905, it amounted for all purposes to 5 574,000 gallons a day, or an average of 38·39 gallons for the estimated population of 145,186 supplied. Within the borough, the population of which is 117,000, the daily consumption was 4,224,000 gallons, or 36·10 gallons per head. High as this rate is, it is 1¼ gallons per day less than it was in the previous year, and 8 gallons per day less than in 1902-3. Mr. Howarth calls attention to this result of the system of night inspection, and points out that if the former rate of consumption had been maintained, it would have meant, with the increase of population, that the average consumption would have been a million gallons a day more than in the year under review. No fewer than 14,023 defects of fittings were found as the result of 25,928 inspections; and Mr. Howarth draws the conclusion from these figures that the number of defective fittings is as large as ever. He anticipates that the difficulties of further reducing the waste will be greater; that, in fact, the energies of the staff will be severely taxed in preventing the rate per head increasing.

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PUBLIC LIGHTING OF EDINBURGH.

Annual Report of the Inspector.

We have received the report of the Edinburgh Cleaning and Lighting Department for the year ending the 15th of May last. It was prepared by the Inspector (Mr. George A. D. Mackay), and is devoted mainly to the first-named branch of his work; but the portion dealing with lighting contains some interesting particulars.

At the close of the year covered by the report (May 15), the city was lighted by 5033 ordinary gas-lamps, 5085 incandescent gas-lamps, and 1052 electric arc lamps; and the common stairs by 11,802 jets. The total lighting expenditure for the year was as follows:—

For street gas lighting, including the cost of gas, with due proportion of lamplighters' wages and incidental expenses	£22,710 12 6¾
For electric lighting, inclusive of incidental expenses	11,444 10 9½
For stair lighting, including gas and the proportion of wages and other expenses	11,545 16 6¾
Total	£45,700 19 11

The lighting expenditure shows an increase of £2493 2s. 4d. over that of the previous year, due to the extension of incandescent lamps and the growth in the number of stair-lights. The lighting staff consisted of 92 lamplighters, two overseers, three gas-fitters, and one mason.

The question of still further extending incandescent lighting engaged the attention of the Committee throughout the year; and Mr. Mackay says the probability is that the current year will see this carried into effect. The consumption of the 5085 incandescent lamps in operation varies as follows: 903 lamps have 2-feet burners, 199 have 2½-feet burners, 3937 have 3-feet burners, and 46 have 4-feet burners. The 3-feet burners are mostly in the main or principal side streets, and the 2-feet burners in the narrower or less frequented ones. The Inspector says the illumination from the 2½-feet inverted burner is so good as to suggest that as the 3-feet burners become worn out they might be displaced by those consuming 2½ cubic feet, without detriment to the effective lighting of the street.

The expenditure on lighting in the year 1905-6 exceeded by £2493 2s. 4d. the sum spent in the preceding twelve months. This is mainly accounted for by the incandescent extensions; no fewer than 2467 flat-flame burners having been converted during the year. The lighting of the city, notwithstanding the marked improvements of recent times, may still be said to be in a state of transition. The illumination of the leading thoroughfares and the car routes by electricity, the partial introduction of incandescent lamps into the less frequented streets, and the additional comfort and security to householders and others by the more effective lighting of the common stairs from sunset to sunrise all the year round, have all been met with general expressions of appreciation. Finality, however, in lighting improvements, even if attainable, is yet in the future; the attitude of the public being in favour of still more light. Mr. Mackay states that "what has been accomplished seems to have but whetted the desire for something better, and has resulted in the formation of a lighting standard of greater excellence. The outlook for the moment is in the direction of converting the whole of the existing flat-flame burners throughout the city into incandescents; and there is a movement on foot for the introduction of the electric light into common stairs."

The activity of those whose business it is to design and provide the instruments and accessories of lighting continues greater than ever. Brains are continually at work devising newer, simpler, and more effective methods. The Inspector says the Department is alive to every echo of improvement; and in December last, when the inverted burner made its appearance on the market, it was at once subjected to practical experiment. This burner gives out the illumination from below instead of from above, with the advantage that it concentrates the light exactly where it is required. It is further accompanied by a lessened vibration, which tends to greater duration of the mantle. Various types of inverted burners were procured from the respective makers; and, after much care and thought, it was decided to adopt the "Star" burner, which is now in evidence in four thoroughfares in the city. Economy in mantles is still carefully looked after; but with a view to maintaining the lighting efficiency at its maximum, partially frayed or faded mantles are more frequently removed than before.

Mr. Mackay gives a table showing the progress and development of electric lighting in the city from 1895-6 to 1905-6. On the 15th of May in the first-named year, the number of arc lamps in use was 245, and their annual cost was £20 each. On the corresponding date this year, there were 1052, the annual cost of which per lamp was £10 15s. and £9 10s. These 1052 arc lamps displaced 3274 gas-lamps, representing 3649 jets. Following these particulars is an interesting table showing the gradual reduction in the price of gas from 1891-2 to the present time. In the year named, the charge to the Corporation was 3s. 6d. per 1000 cubic feet, and to the public 1s. per more. At the beginning of the century the public rate was 2s. 5d., and the private one 3s. In the three succeeding years, there was a rise of 3d. in the public rate; but it was brought back to the old figure in 1903-4, and has been continued—the gas supplied to the incandescent burners being priced at 2s. per 1000 cubic feet. The private rates were 3s. 4d. and 3s. in 1902-3, and 3s. and 2s. 9d. in 1903-4; and the latter figure has been charged since.

The number of lamps in use in the year 1890-1 was 9586; in the year reported upon, it was 10,118. Mr. Mackay says the waste of lighting plant is very considerable, arising not so much from ordinary wear and tear, as through carts and other vehicles coming into collision with the lamps, and also not infrequently through malicious mischief on the part of idle boys and night marauders. Breakages from these causes are very frequent; the replacing of the damaged or broken tops, globes, and pillars representing a considerable annual expenditure.

RADIATOR PICTURES, No. 2.

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It happens at times that a constable is on the spot when a breakage occurs, and a detailed report of the circumstances is sent to the department. In cases where there is no direct police testimony, the officers endeavour to trace the authors, and, when successful, intimate the particulars to the Inspector of Lighting, who, in all cases where information is available, assesses the damage, passing on the claim to the Public Prosecutor, who takes steps to recover the amount from the responsible persons. The average annual amount of claims lodged is about £106. The growth of the demands on the stair-lighting service is shown by a tabular statement for the past nine years. In 1897-8, the number of jets in use was 7982; in 1901-2, it was 9526; and last year it was 11,802. The factors accounting for this growth are the improved lighting standard, the annexations, and the erection of new buildings.

The expenditure on the public lighting in the past year was £45,700 19s. 11d., and the revenue was £67 11s. 1d. The net expenditure was therefore £45,633 8s. 10d. The population being 341,035, the cost per head works out to 2s. 8d., and the cost per pound on the assessable rental is 3⅜d.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

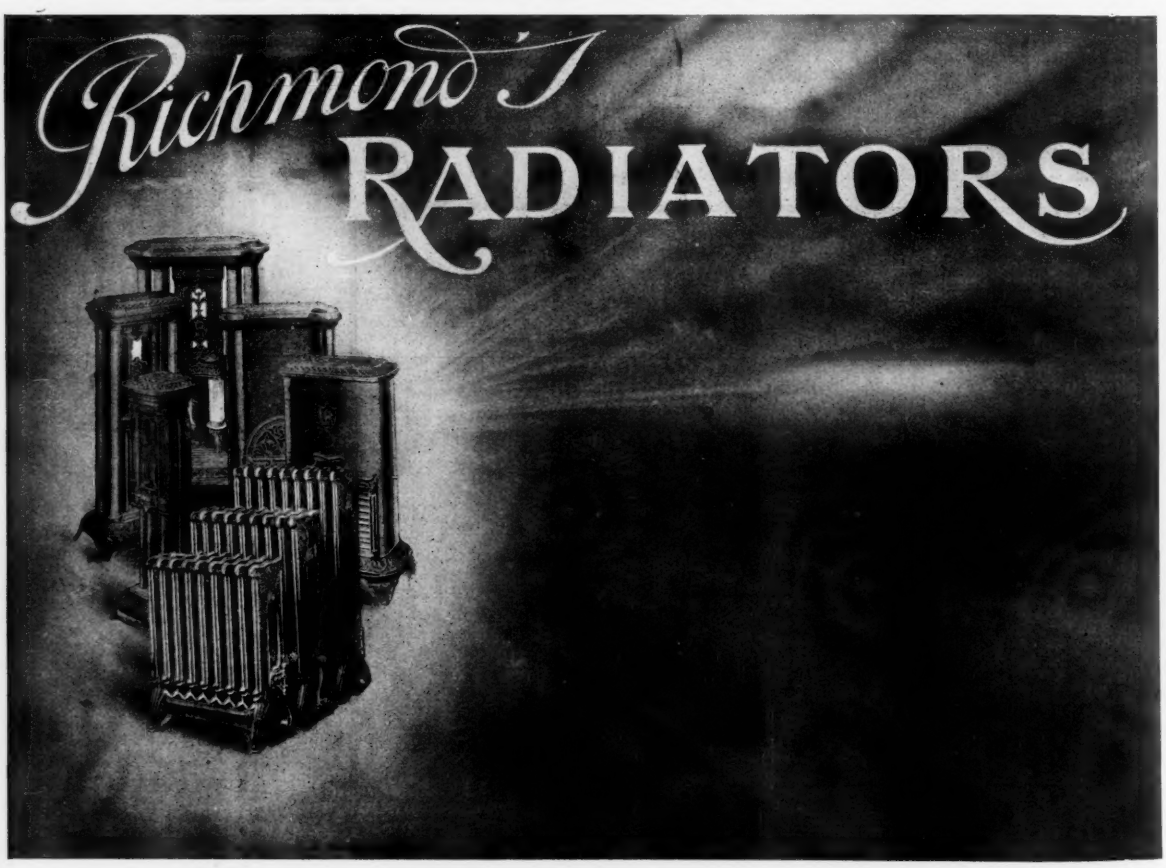
Saturday.

The Kilmarnock Town Council at their meeting this month adopted the burgh accounts for the year ending May 15. In the gas accounts, the expenditure upon capital is shown to have been £1553, raising the amount to £88,435. The revenue amounted to £25,572. Of this sum, £20,554 was derived from the sale of gas, £3296 from tar and sulphate of ammonia, and £1687 from coke. The expenditure amounted to £21,335, of which £16,642 was incurred in the manufacture of gas; £2392 in its distribution; £1125 was paid in rates and taxes; administration cost £489; and general charges £686. There was thus left a surplus of £4238. With this sum the net revenue account was raised to £9643. After meeting the customary charges, including £3183 for the repayment of loans and interest, and making up a deficiency of £1041 upon the electricity account, there is a balance carried forward in the net revenue account of £5171. The sinking fund amounts to £1609. The quantity of gas manufactured was 164,136,700 cubic feet; being at the rate of 9200 cubic feet per ton of coal carbonized, and an increase of 782,700 cubic feet over the previous year. Unaccounted-for gas was equal to 8 per cent.; being slightly higher than in the preceding year. The revenue from gas was less by £310, and that from residual products greater by £813. In a note, the Auditor—Mr. A. J. Fergusson, of Glasgow, says: "The whole of the expenditure on meters and stoves, amounting to £1769, has been charged against revenue (no account having been taken of the value of those in stock or on hire); and the surplus revenue is accordingly understated by the present value of these goods." The coal carbonized was 17,890 tons, and the cost £8 721. The profit on the working was equal to 7·28 per cent.

A visit of a nature which has not hitherto been undertaken by the Junior Association of Scotland was paid this afternoon by members in the Western District to the New Grange Meter Works in Edinburgh of Messrs. Alder and Mackay. An account of the visit will be found on p. 312.

A week or two ago I mentioned that there was some difficulty about the lighting by gas of the village of Laurieston, near Falkirk, the contract for which has been obtained by the Redding Gas Company. The matter has been cleared up now, by the holding of a meeting of ratepayers the other night, at which the representatives of the community upon the County and Parish Councils explained how matters stood. It appears that seven years ago twenty-three gentlemen signed a requisition to the County Council, asking that a lighting district be formed. These matters move slowly; and in this case so slowly that one gentleman at least was surprised to learn that he had himself signed the requisition. It was explained that the County Council obtained a quotation from the Redding Gas Company. If they had asked the Corporation of Falkirk to introduce gas, they would have charged them the cost of laying the pipes; but the Redding Company had laid the pipes at their own expense. They had also given a guarantee that they would supply gas for the public lamps at 5 per cent. less than to ordinary consumers. Further, the contract is only from year to year; so that their interests in the matter of price are safeguarded, because if the Company should raise the price, the Council could enter into negotiation with the Corporation of Falkirk, or any other body, for a supply of gas. After a discussion, a vote of unabated confidence in the County and Parish Council representatives was unanimously passed.

In an article which is published to-day in the "Falkirk Herald," an account is given of the arrangements for the lighting of the village of Cumbernauld, some extracts from which I give. The place is situated on the road between Glasgow and Stirling. In the old coaching days, it was of some activity; but, like many other places, it has not succeeded in securing an efficient railway service, and has consequently fallen upon evil times. The population numbers only somewhere about 1100. The writer says: "About half-a-century ago, Cumbernauld was lighted with gas. To-day it is lighted with oil. The derelict gas-works remain in the place, a nuisance and an eyesore to everybody. They stand to remind us that, in the matter of lighting at least, Cumbernauld has seen better days, when there were men of sufficient public spirit who sought to promote its interests by providing it with a proper system of lighting. There is no attempt at street lighting now; the only light being reflected from shop or house windows or doors. . . . Cumbernauld had a gas lighting system nearly fifty years ago. From what we have been able to gather, a certain Mr. Waddell began the gas-works in Cumbernauld at that time as his own private concern. The works were subsequently acquired by certain local gentlemen; but as the business had never been from the first a profitable one, the works were allowed to go out of repair. Getting weary of waiting for the profits which were never realized, and being unwilling to launch out any more money on bringing the works up-to-date, the local Company



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to whom they belonged sold them to a gentleman hailing from Beith. The latter spent some money in putting the works into order, and did his best to carry them on successfully. The price of gas, however, was raised at one time or another from 7s. 6d. to over 10s. per 1000 cubic feet; and as the consumers could not afford to pay the high price, they gradually dropped off, and the business having fallen to such an extent he was obliged to abandon the works entirely. . . . The gasometer, about 20 feet in diameter, is sunk to a level with the ground, surrounded with a low barbed wire fence. It is filled with putrid and foul-smelling water to a depth of over 16 feet. The thin metal plates on the top of the gasometer have got worn with age and neglect. Several are rotted completely through, and the large holes reveal the filthy, stagnant water with which it is filled. It is at once obvious that apart from the injury to health which is likely to be caused by the most offensive smell coming from it, the gasometer in its present state is a serious menace to human life."

The Lanark Town Council had before them, at a special meeting on Monday, the report by Mr. W. R. Herring, of Edinburgh, upon the condition of the works of the Lanark Gas Consumers' Company, which the Corporation propose to acquire. As the document is of importance, on account of the eminence of its author, I send it for publication in another column (see p. 332). The Gas Company are not yet in a position to make any offer to the Town Council, as they wish to procure the advice of an expert before fixing a price; and the Council have accordingly agreed to delay coming to a decision in the matter. They have passed the first resolution to adopt the Burghs Gas Supply Acts; and as the second meeting, for confirmation of that resolution, cannot be held till after the municipal election, they are not in a position to make any offer, nor to serve a notice on the Company.

The Perth Gas Committee on Monday had before them the Provisional Order which they are applying for in connection with the gas undertaking. Lord Provost Cuthbert said that a great deal of the usefulness of the Order had been taken away by the refusal of the authorities to pass the clauses providing for the compulsory purchase of gas annuities. A large number of the powers asked for were struck out, because they already belonged to the Corporation, under existing Acts of Parliament. He considered, however, that the additional powers which would be obtained by them in the Order were well worth applying for, and would be found to be of considerable advantage to them.

On Monday of last week, the opening ceremony took place of extensions to the Corporation Electric Light Works in Broughty Ferry, the Joint Engineers for which were Mr. G. Keillor, the Gas Engineer, and Mr. J. Turnbull, the Electrical Engineer. The extensions will enable the Corporation to about double the output of electricity. In the course of some speaking which followed the opening ceremony, acknowledgment was made of the valuable assistance which was given by Mr. Keillor in the work. The health of the Gas Manager was proposed by Mr. Crystal, the Convener of the Gas Committee, who said that the Gas Department was the milch cow of the burgh, and that by next year he hoped they would have their deficit entirely wiped off. The one man to whom they were indebted for that was Mr. Keillor. No one who visited the gas-works could fail to observe the improvements that had been effected. For tidiness, and the way in which the work was done, he was safe in saying there were no better works in Scotland. Mr. Keillor, in a word, returned thanks.

CURRENT SALES OF GAS PRODUCTS.

Week ending Oct. 27.

Tar products in the London market are firm, but quiet. There has been much more demand for pitch for prompt shipment; but prices have not altered. 90 per cent. benzol is in good demand at 11d.; 60° crude carbolic at 1s. 9d. to 1s. 9½d.; while 35° crystal carbolic is firm at 5⅞d. net. There is a large demand for ordinary London creosote, for which 2⅜d. to 2½d. naked is being asked at the makers' works. Sulphate of ammonia is very strong, and £12 10s., on Beckton terms, could not now be accepted for this year; and much higher prices are asked for next.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 27.

The improvement in the market referred to in the last report has continued, and prices have gradually hardened; so that at the close the quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 8s. 9d. per ton f.o.b. Leith. There has been considerable buying for the purpose of covering contracts for October delivery, but direct buyers have been more serious in their operations than has been the case for some time past. November-December delivery has also been in request at a slight premium on current prompt prices. January-June has again been done at £12 10s. per ton, and April-September at the same price, but for the earlier position £12 12s. 6d. per ton is quoted at the close.

Nitrate of Soda.

This article is a shade easier, but in the main the position is unchanged. Spot prices are 11s. 7½d. and 12s. 4½d. per cwt. for ordinary and refined qualities respectively.

Tar Products. LONDON, *Oct.* 27.

Markets have been steady during the past week, with the exception of pitch, which still shows a decided tendency to weakness, especially for this year's delivery. Business has been done on the east coast at 27s. 6d. to 28s. for prompt delivery; while low prices have been accepted for delivery to the end of the year. In Liverpool, 28s. has also been taken; and a little under this is reported to have been accepted at a west coast port. As regards London, makers are fairly well sold, and quote 31s.; but second-hand parcels could be bought at considerably under this. There is still an absence of demand both from the Continent and South Wales; consumers in these districts stating that they are well covered for their present requirements. Creosote remains

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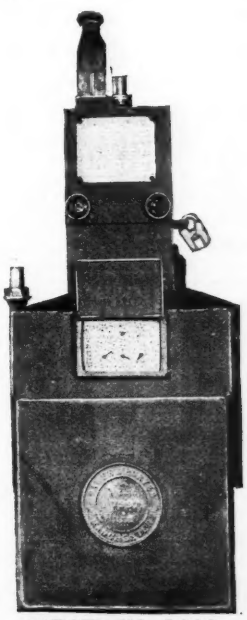

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in good request in all quarters. The position of the London makers is unchanged. They have practically none to spare for delivery from now to the end of the year; while for next year they do not care to quote except at high prices—evidently believing in a continuance of the present strong demand. In the North, manufacturers are very well sold, and do not care to commit themselves further. In the Midlands, very little oil is obtainable, and good prices are reported to have been paid for delivery from now to the end of March. In carbolic acid, the market remains in about the same position. Continental consumers will pay 1s. 9¼d. for prompt delivery, but do not care to commit themselves forward except at a reduction on existing prices. English consumers appear fairly well covered for their present requirements. The position of crystals remains unchanged, and a fair amount of business takes place from time to time at existing prices. There is practically no change in the position of toluol, which continues in fairly good demand. Manufacturers are fairly well sold, and are not disposed to entertain further business except at an advance. The demand in London for benzol is very good, and prices show a slight advance for delivery to the end of the year; while there is some inquiry for delivery all over next year, for which period, however, makers are not anxious to quote. 50-90 per cent. is still scarce; and 1s. per gallon is reported to have been paid on the east coast over the first few months of next year. Solvent naphtha is firm, and there is very little offering for this year's delivery. For next year, certain manufacturers appear to be willing to sell at about 1s. 3d. on the east coast; but they have some difficulty in obtaining this price.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 29s. 6d. to 30s. 6d.; east coast, 27s. 6d. to 28s. 6d.; west coast, 28s. Benzol, 90 per cent., 10¾d. to 11d.; 50-90 per cent., 11⅜d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4⅜d. to 4⅞d.; solvent naphtha, 1s. 2d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2 3/16d. to 2⅛d.; North, 1 11/16d. to 1¾d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 9¾d. Naphthalene, £4 10s. to £9; salts, 31s. 6d. to 32s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market is still very firm indeed. The London Companies have raised their price to £12 12s. 6d. for November-December delivery; while for January-April, they now ask £12 15s. In Hull, business has been done in a fine make at £12 7s. 6d. for November shipment; but sales are reported of ordinary makes at £12 5s. In Leith, at the beginning of the week, £12 7s. 6d. was refused for November delivery, but later on business was done at £12 8s. 9d. In Liverpool, business has been done at £12 5s. to £12 7s. 6d. according to quality. In all cases there is a good demand for forward business, for which a considerable increase is asked.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Since our last issue, the coalowners of the Wigan district of Lancashire and Staffordshire have resolved to raise the price of house coal 1s. per ton as from Nov. 1. This heads the rise in the Manchester district by 2d. per ton. The coal trade of the County Palatine is reported in a satisfactory condition. The increase in house coal has been very considerable. There is also a strong demand for engine fuel, and top rates are fully maintained. On new contracts, from 3d. to 6d. advance per ton is readily secured. There is more inquiry for gas coal and cannel, and an improved demand for furnace coke, for which slightly better prices are being realized. The average quotations at the pits are: Best house coal 13s. 6d. to 14s. 6d. per ton, second qualities 12s. 6d. to 13s. 6d., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. to 7s., common 5s. 6d. to 6s. 6d., shipping coal 9s. 6d. to 10s. 6d., coke 17s. to 24s. An advance of 5 per cent. in miners' wages is to be brought before the Coal Conciliation Board this week. In most of the districts non-Union men are joining the ranks of the Federation.

Northern Coal Trade.

The coal trade is now more active, as there is a sharp demand for export after the duty is taken off in a few days; while the home request increases steadily as usual at this season. Against these favourable influences, however, there is that reduction of the exports to the upper ports of the Baltic, which is also usual at this period. For steam coals, the demand is steady; and the prices show a sharp advance since the last report—best Northumbrians being now from about 11s. 3d. to 11s. 4½d. per ton for early delivery. Second-class steams are 10s. to 10s. 3d., and steam smalls are irregularly higher—about 7s. to 7s. 6d. being quoted f.o b. There is now a very full consumptive demand for gas coals; and the prices vary, according to quality, from 9s. 9d. to 11s. 3d. per ton f.o.b.—the very best Durham kinds being rather scarce for early delivery. One or two small contracts have been placed at prices within those quoted; but there does not seem much to be allotted at the present time. Some collieries, which have contracted freely forward, do not appear anxious to sell the remnant of their production, as they hope for better prices in the future. Coke is higher; and this benefits gas coke, which is quoted now from 12s. 9d. per ton, and even up to 14s. for good gas coke f.o.b. in the Tyne.

Scotch Coal Trade.

Trade is active, and prices are rising, with a prospect of their going still higher. For house coal, the summer has been a poor one. Now the prices have been advanced by a shilling per ton; but that is usual at this time of the year. There is a big request for shipping. Although the figures are down, that is due to the stormy weather, and not to lack of demand. The prices quoted are: Ell 9s. to 10s. 3d. per ton f.o.b. Glasgow, splint 10s. to 10s. 3d., and steam 8s. 9d. to 9s. The shipments for the week amounted to 277,120 tons—a decrease of 876 tons upon the preceding week, and of 17,412 tons upon the same week of last year. For the year to date, the total shipments have been 11,141,123 tons—an increase of 1,214,301 tons upon the corresponding period of 1905.

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R. & A. MAIN, LTD.,

LONDON, GLASGOW, FALKIRK, &c.

Sentence on a Gas Collector.—A collector of the Gaslight and Coke Company, named Frederick Moses, was last Thursday sentenced at the Westminster Police Court to three mouths' hard labour for falsification of accounts and embezzlement. The defalcations extended over many months; and the man had so far falsified his books that suspicion was thrown on consumers of robbing their own meters. He had also tried to suborn one of his fellow workers to assist him with false entries. Detective Cornelius, who arrested Moses, said that the accused told him he had got into great difficulties through buying furniture on the hire system, and could not get straight. The accused pleaded guilty to the charge of embezzlement.

Nominee Gas Directors at Sheffield.—As the outcome of the discussion in the Sheffield City Council which was reported in the "JOURNAL" for the 16th inst. (p. 192), it has, on the motion of Alderman Uttley, now been resolved that the following be a Standing Order of the Council: The Nominee Gas Directors of the Sheffield United Gaslight Company shall present to the Council at the September meeting in each year a report relating to the Company, containing information as to the working of the undertaking and any contemplated developments, and particularly with reference to any intended application to Parliament; and the Town Clerk shall, in the month of July in each year, notify this Standing Order to the Nominee Directors.

Louth Gas Company.—According to the report and statement of accounts presented at the recent annual meeting of this Company, there was a surplus of £1154 after payment of the dividends recommended. Out of this sum, £500 has been transferred to the contingent fund, and the remainder carried forward. There was an increase in the sale of gas, but, on account of a reduction in the price to 3s. 3d. per 1000 cubic feet, the receipts were less. Coal was 3d. per ton higher; but more gas was produced, and the quantity unaccounted for was less than 5 per cent. on the make. The report was adopted, and the following dividends were declared: On the original capital, 14¼ per cent.; on the improvement stock "A" and "B," 5 per cent. each; and on the new ordinary (1877) stock, 11¼ per cent.

Proposed Water Supply for Billingshurst.—When the gas-works of the North Sussex Gas and Water Company at Billingshurst were planned, the idea was to give the town also a supply of water; and in the purchase of land this was kept in mind. It is now proposed to carry it into effect; and a meeting of the shareholders was held at the gas-works last Friday, when the matter was gone into and definite action taken. Mr. Charles Wheeler, the Chairman of the Company, presided, and stated that a general desire existed in the district that they should provide a supply of water; and, as parliamentary powers were already in their possession, the Directors asked the shareholders to sanction the raising of the necessary additional capital. He proposed an issue of £7500 of 6 per cent. preference stock at par; and the motion was carried unanimously.

Cost of the Paignton Water-Works.—In a statement respecting the estimates for the new rate which be made at a recent meeting of the Paignton Urban District Council, Mr. H. Parnell, the Chairman of the Finance Committee, said one of the chief causes of the heavy rate now imposed was the extensive water scheme which they were carrying out, the estimates for which had been very much exceeded. The water-rate having reached its maximum, it was necessary to draw on the district rate. The amount required from the ratepayers for the half year to meet the deficiency on the water account was £1355, or a rate of 6½d. in the pound. When the works were completed, and Brixham and Teignmouth were taking supplies of water, there would be an estimated return of £2500 a year, which would be equal to 1s. in the pound; and the rates would be reduced by 6d. each half year. On the other hand, a further sum of £18,000 would have to be borrowed to complete the work; and interest and sinking fund on this expenditure would be equal to a rate of 6d. in the pound per annum. They hoped, however, that the effect of the improved water supply would be to increase the number of houses in the town, and add to the consumers of water and to the rateable value of property. Mr. Ham, the Chairman of the Water Committee, said that unfortunately the £18,000 referred to would not be the extent of their requirements. They would eventually have to borrow £20,000; but it was hoped that the full effect of the additional expenditure would not be felt for two years, by which time Brixham and Teignmouth would perhaps be contributing to the revenue of the undertaking.

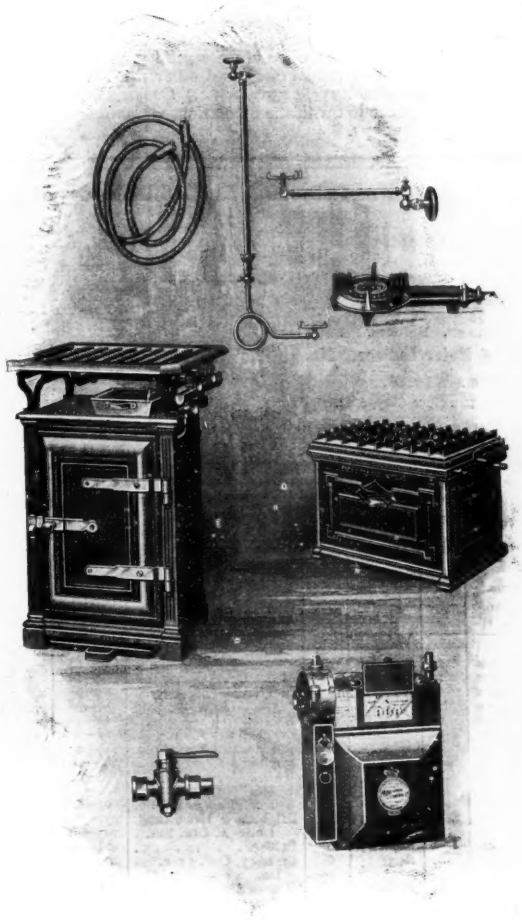
Proposed Auxiliary Water Supply for Coventry from Birmingham.—At the meeting of the Coventry City Council last Wednesday, the report of the Water Committee containing the terms of the proposed arrangement for a supply of water from Birmingham, to which reference was made last week (p. 267), was presented and fully discussed. Alderman Bird (the Chairman of the Committee) moved that the Council make application to Parliament for an Act to enable the Birmingham Corporation to afford the supply. He stated that by this means water would be obtained much more quickly than by sinking wells, and it would be easy to get 2 million gallons per day from the surplus stock at Shustoke. Alderman Andrews opposed the motion, on the ground that no evidence had been given of the quality of the water; and he strongly advised the sinking of artesian wells. A rider was moved that power should be obtained for a supply of Welsh water from the Birmingham Corporation should the proposed scheme not prove satisfactory. Dr. Webb Fowler said this power would be included in the proposed Act, and that a standard of purity of the water supplied would be arranged. The Town Clerk (Mr. G. Sutton) called attention to the clause in the agreement bearing upon the matter, and added that he would suggest, in any further dealings with Birmingham, that if Coventry could not obtain the powers specified, the whole matter should be dropped. It was decided to hold a special meeting of the Council to further consider the subject. This was done yesterday, when, after deliberating in private for two hours, the scheme submitted by the Water Committee was adopted; and instructions were given to them to endeavour to obtain a clause in the proposed Bill empowering Birmingham to give, and Coventry to take, a supply of Welsh water, on terms as to price and other conditions to be mutually agreed upon.

PARKINSON'S

COMPLETE

SLOT

INSTALLATIONS.



PARKINSON AND W. & B. COWAN, LTD.

(Parkinson Branch),

Cottage Lane, City Road, LONDON.

Bell Barn Road, BIRMINGHAM.

In their annual report, the Retford Gas Committee recommend the Town Council to make, as from Jan. 1 next, a reduction of 3d. per 1000 cubic feet in the charge for gas to ordinary consumers and to users of motive power. The present price is 2s. 9d. per 1000 cubic feet.

At a meeting of the Sun Gas Company, Limited, held last Friday, the shareholders unanimously passed a resolution altering the name to the "Alby United Carbide Factories, Limited." The Chairman (Mr. A. E. Barton) stated that the alteration was considered necessary on account of the principal business of the Company being the manufacture of carbide of calcium.

A large quantity of water ran to waste at Shipley last week, in consequence of the bursting of a water-main. The pipe is connected with the low-level service, and is 10 inches diameter. On cutting down to the pipe, it was found to be split open to the length of about 6 inches; the gap being an inch or more in width. The pipe is an inch thick, and not corroded. The cause of its bursting, therefore, cannot be definitely ascertained.

A suit against a water company for losses due to a fire, where the water supply was defective, was recently brought before the Alabama Supreme Court, who followed the precedents of the Courts of most other States where the question has arisen, and decided that a resident of a city cannot recover damages for loss by fire occasioned by the failure of a water company to furnish a supply of water in accordance with their contract with the city.

On Monday last week, a gas exhibition was opened under the auspices of the Chester United Gas Company in the Assembly Room of the Town Hall. The stove exhibits are furnished by Messrs. Fletcher, Russell, and Co., Limited, and by John Wright and Eagle Range, Limited. Both firms have excellent assortments, including the former's patent gas-heated self-contained steam-boiler with automatic gas-controller, and the latter's "St. Andrew" gas-heated steam-radiator. The Welsbach Company have a good show of burners; Messrs. Thomas Glover and Co., Limited, display the Sale and Onslow system of high-pressure lighting and a collection of meters; Messrs. Sawer and Purves show their "Positive" prepayment and other meters, and a number of coin conveyances, trays, counters, &c. Cooking competitions are being held in connection with the exhibition, which it was arranged to keep open for ten days.

The Directors of Meters Limited have declared an interim dividend on the ordinary shares at the rate of 5 per cent. per annum.

At the Bakers' and Confectioners' Exhibition held recently in the Agricultural Hall, the Richmond Gas Stove and Meter Company, Limited, exhibited their special apparatus suitable for these trades.

The Oldham Corporation have placed a repeat order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a new retort-bench on Waddell's regenerative principle, consisting of eight through arches 20 feet long with settings of eight retorts, complete with bench bracing, stage floor, and retort mountings, foul main, &c., at their Hollinwood works. When this order is completed, the retort-house in question will contain 32 settings on their regenerative system. The eight through settings completed twelve months ago have given every satisfaction to the Engineer. The work has to be carried out to plans and under the supervision of the Corporation's Gas Engineer, Mr. T. Duxbury.

The annual smoking concert and prize presentation in connection with the Hastings Gas-Works Cricket Club took place at the Company's Offices last Wednesday evening—Mr. C. E. Botley, M.Inst.C.E., the Engineer, in the chair. Mr. Kendall presented to Mr. Botley, as President of the Club, the trophy and cup, holding them jointly with the Rovers' Club. Mr. Harvey du Cros, M.P., proposed "The Health of the Club," which was responded to by Mr. F. J. Winter, who said the club had played 17 matches, winning 12, losing 3, and drawing 2. Last year they won 11 and lost 5. In League matches they won 10 and lost 2, gaining 20 points out of 24. Last year they were third in the League. This year they were proud of being bracketed champions with the Rovers. "The Health of the President" having been honoured, Mr. Botley responding, said he had always given the club his best support. He did not think he had done more than he ought, as Chief Officer of the Gas Company, to encourage good fellowship, athletic exercise, and enjoyment. He should always value the presentation. He then distributed the prizes. The Vice-Chairman (Mr. C. F. Botley), in proposing "The Visitors," alluded to the Company's pension and superannuation fund which was formed some years ago by Mr. C. E. Botley and Mr. Piper, and which the Directors kindly supported. The men contribute to the fund (which is also a sick fund) during the time they are in the Company's service, and when they retire they get 12s. a week for life.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

FOREMAN. No. 4670.
GAS COLLECTOR AND CLERK. Pontycymmer Gas-Works.
MANAGER (Gas Cooking and Heating Appliances Works) No. 4675.
TRAVELLER. No. 4673.

Testing Meter Indices. No. 4,668.

Situations Wanted.

TRAVELLER (Fire Clay, &c.). No. 4674.

Gas Works (Complete) for Sale.

YSTALYFERA GAS COMPANY, SWANSEA VALLEY.

Plant, &c., for Sale.

ANNULAR CONDENSER, WASHER, AND GOVERNOR. Leatherhead Gas Company.
EXHAUSTER AND ENGINE. Redditch Gas-Works.
PEDESTAL LAMPS. 192-3, Shoreditch.

Stocks and Shares.

GREAT YARMOUTH WATER COMPANY. Nov. 20.
HUNGERFORD GAS COMPANY. Nov. 13.
ILFORD GAS COMPANY. Nov. 13.
KINGSTON GAS COMPANY. Nov. 21.
SOUTHEND GAS COMPANY. Nov. 20.
SOUTHEND WATER COMPANY. Nov. 13.

TENDERS FOR

Fire Clay Goods.
WOKINGHAM GAS DEPARTMENT. Tenders by Nov. 19.

Oil for Gas Making.
STOCKPORT GAS DEPARTMENT. Tenders by No. 21.

Oxide (New and Spent).
WISBECH LIGHTING COMPANY.

Sulphuric Acid.
BANGOR CORPORATION. Tenders by Nov. 15.

Tar and Liquor.
BANGOR CORPORATION. Tenders by Nov. 15.
STOCKPORT GAS DEPARTMENT. Tenders by Nov. 21.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 297.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20–21	–½	5 0 0
245,112	10	,,	7½	Do. 7 p.c.	14–15	..	5 0 0
200,000	5	May 11	7	Bombay, Ltd.	6¾–7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5¾–5¾	+¼	4 17 5
50,000	10	Aug. 30	14	Bourne- 10 p.c.	28–29	..	4 16 7
51,810	10	,,	7	mouth Gas B 7 p.c.	17–17½	+¼	4 0 0
53,200	10	,,	6	and Water Pref. 6 p.c.	14½–15½	–1	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260–265	..	4 14 4
300,000	,,	,,	9½	Do. New	198–203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb.	103–106	..	3 15 6
270,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230–235	..	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	163–168	..	4 18 3
460,000	20	Sept. 27	10	British	40½–41½	..	4 16 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	120–124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c.	90–93	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11⅞–12¼	–¼	5 14 3
250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96–98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24–26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	5½–10*	..	4 10 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk	98–100	..	4 10 0
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½–110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110–113	–1½	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	108–111	–1½	4 10 1
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84–86	..	3 9 9
200,000	Stk.	,,	6½	Continental Union, Ltd.	121–124	–1	5 4 10
200,000	,,	,,	7	Do. 7 p c, Pref.	140–145	..	4 16 7
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105–107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24–25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Aug. 15	4½	Gas- 4 p.c. Ord.	96–98	..	4 9 9
2,600,000	,,	,,	3¾	light 3½ p.c. max.	87–89	–1	3 18 8
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	105–108	–1	3 14 1
4,193,975	,,	June 14	3	Coke 3 p.c. Con. Deb.	84–86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98–103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118–121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½–20½	..	5 7 4
7,940,000	Stk.	May 11	8	Imperial Continental	185–188	–1	4 5 1
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95–97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120–125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107–109	..	3 13 5
561,000	Stk.	Aug. 30	10	Liverpool United A	230¼–232½	+¼	4 6 1
718,100	,,	,,	7	Do. B	169–170	+1	4 2 4
144,140	Stk.	Sept. 13	7½	Maidstone 5 p.c.	145–1 0	..	5 1 8
75,000	5	June 28	5	Malta & Medn., Ltd.	4¼–4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101–103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	May 31	3½	Monte Video, Ltd.	11½–12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con	111–112	–½	4 2 7
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98–100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20–21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½–14½	..	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd.	152–155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	5⅝–6⅝	..	5 12 0
398,490	5	Oct. 26	7	Primitiva Ord.	⅞–1	+¼	4 7 6
796,980	5	July 27	5	Do. 5 p.c. Pref.	5–5½	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
851,070	10	Oct. 12	7	River Plate Ord.	12½–12⅝	–¼	5 7 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96–98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd.	13½–14	–¼	5 14 4
70,000	50	July 2	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	244–246	..	4 1 4
209,984	,,	,,	10	Do. B	244–246	..	4 1 4
523,500	,,	,,	10	Do. C	244–246	+1	4 1 4
70,000	10	Oct. 26	10	South African	15½–16½*	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128–130	–2	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85–87	..	3 9 0
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	156–158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c	123–126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123–126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128–133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord.	107–112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham A 5 p.c.	127–130	+1	5 0 0
588,020	,,	,,	5	and B 3½ p.c.	104–106	+1	4 14 4
137,500	,,	June 28	4	Edmonton 4 p.c. Deb.	103–105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10½–11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104–106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	105–107	..	4 13 6
30,000	Stk.	Aug. 15	8	Wands- A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth B 3½ p.c.	137–142	..	4 11 7
75,000	,,	,,	5⅝	and C 3½ p.c.	113–115	..	4 17 5
79,416	,,	June 28	3	Putney 3 p.c. Deb. Stk	82–85	..	3 10 7
379,875	,,	Aug. 15	5½	West Ham 5 p.c. Ord.	104–106	..	4 16 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120–123	..	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103–106	..	3 15 6

Prices marked * are "Ex div."